JOB CREATION AND ITS DETERMINANTS IN MALAYSIAN MANUFACTURING SECTOR

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ABSTRACT

Despite of manufacturing sector being among the sector which record the major contributor to National Income of Malaysia, the unsettle issue is whether employment growth in the manufacturing sector actually reflect the rate of job creation in that sector. Thus, this present study emphasize on calculating job creation rate, systematically to get reliable information regarding job creation in Malaysian manufacturing sector. This study calculated job creation rate in the Malaysian manufacturing sector between year 2005 to 2015. Further, using descriptive analysis, this study found that the job creation pattern among the industries in the High Technology sub-sector is highly fluctuated as compared to other sub-sectors. Besides that, this study also analysed the determinants of the sector's job creation using the GMM-System technique where the impact of real output, real wages, real assets, and real research and development (R&D) expenditure of the manufacturing sector on the sector's job creation is tested. The finding suggests that the selected variables are significantly affect job creation. Real assets, lag real R&D expenditure and lag job creation influenced positively the job creation. While, real output, real wages and real current R&D expenditure influenced negatively. The contributions of this study are twofold; first, it could provide useful information for the labour force to identify the group of sub-sectors which contribute to the sector's job creation, in the event of job seeking. Secondly, the information could be useful for policy- makers to focus on the corresponding groups of sub-sectors in terms of the allocation of the sector's resources as to promote job creation in the Malaysian manufacturing sector.

Keyword: job creation, employment growth, manufacturing sector, panel data, determining factors

ABSTRAK

Walaupun sector pembuatan merupakan antara sektor penyumbang utama terhadap Pendapatan Negara Malaysia, namun terdapat isu yang kabur iaitu sama ada pertumbuhan pekerjaan dalam sektor pembuatan di Malaysia sebenarnya mencerminkan kadar penciptaan pekerjaan dalam sektor tersebut. Oleh itu, kajian ini menekankan pengiraan kadar penciptaan pekerjaan secara sistematik untuk mendapatkan maklumat yang benar mengenai kadar penciptaan pekejraan dalam sektor pembuatan di Malaysia. Kajian ini menganalisis penciptaan pekerjaan dalam sektor pembuatan di Malaysia bermula dari tahun 2005 hingga 2015. Seterusnya, menggunakan analisis deskriptif, kajian ini mendapati bahawa corak penciptaan pekerjaan di Kumpulan Subsektor Berteknologi Tinggi adalah berubah-ubah berbanding kumpulan subsektor lain. Selain itu, kajian ini menganalisis penentu penciptaan pekerjaan dalam sektor ini menggunakan teknik GMM-System dimana kesan output benar, upah benar, aset benar serta perbelanjaan penyelidikan dan pembangunan benar (R&D) sektor pembuatan terhadap penciptaan pekerjaan dalam sektor ini dianalisis. Penemuan kajian ini menunjukkan bahawa pemboleh ubah yang dipilih adalah penting kepada penciptaan pekerjaan sektor pembuatan di Malaysia. Asset benar, perbelanjaan R&D benar pada tahun terdahulu dan penciptaan pekerjaan pada tahun terdahulu mempengaruhi penciptaan pekerjaan secara positif. Manakala, keluaran benar, upah benar dan perbelanjaan R&D benar mempengaruhi secara negatif. Hasil kajian ini menghasilkan dua sumbangan utama; pertama, ia mampu membekalkan maklumat kepada tenaga kerja untuk mengenal pasti kumpulan subsektor yang menyumbang kepada penciptaan pekerjaan dalam situasi mencari pekerjaan. Keduanya, hasil kajian ini juga bermanfaat kepada pembuat dasar dari segi tumpuan kepada kumpulan subsektor berkaitan bagi pengagihan peruntukan sumber yang bertujuan untuk meningkatkan penciptaan pekerjaan dalam sektor pembuatan Malaysia.

Kata kunci*:* penciptaan pekerjaan, pertumbuhan pekerja, sektor pembuatan, panel data, faktor penentu

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LIST OF ABBREVIATION/NOTATION

GDP	Gross Domestic Product
ETP	Economic Transformation Program
E&E	Electric and Electronic
R&D	Research and Development
GMM	Generalized Method of Moment
OECD	Organisation for Economic Co-Operation and Development
MDOS	Malaysian Department of Statistics
LDT	Labour Demand Theory
CDT	Creative Destruction Theory
VAR	Vector Auto-Regression
MS-AR	Markov Switching Auto Regressions
OLS	Ordinary Least Square
MSIC	Malaysian Industrial Standard Classification
EPF	Employees' Providence Fund
RM	Ringgit Malaysia
POLS	Pooled Ordinary Least Square
RE	Random Effect
FE	Fixed Effect
VIF	Variance Inflation Factor
LM	Lagrange Multiplier
IV	Instrument Variable
2SLS	Least-Square Estimators of The Least Squared
MIDA	Malaysia Investment Development Authority
MITI	Ministry of International Trade and Industry
BNM	*Bank Negara Malaysia*
EPU	Economic Planning Unit
AMIC	Aero Structure Manufacturing Innovation Centre
HSBB	High Speed Broad Band

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Malaysia is a country that has succeeded in achieving rapid economic growth after her independence in 1957, having evolved from being an agricultural and commodity-based economy to one that is industrial-based. Malaysia is currently undergoing a transformation process to become one of the top 20 countries in the economic development, social progress and innovation at the global level (Economic Planning Unit, 2016).

As reported by the Economic Planning Unit (2016), to support the Malaysia's growth of Gross Domestic Product (GDP), four main structural changes are in progress. One of them is to strengthen the manufacturing sector. The report records that the manufacturing sector contributes the average of 13% from year 2001 until 2011 to national production per annum. Increase in the contribution of the industrial output to national output is stable, as a result of uprising demand in the domestic-oriented and natural-based industries in addition to the improvement and development of living standards and purchasing power among consumers.

Malaysia introduced the Economic Transformation Programme (ETP) in 2010 to accelerate industrial output innovation. The transformation programme involved a number of sub-industries in the manufacturing sector, namely Electrical and Electronics (E&E) industry, Petroleum and Energy-based industry, Natural-based industry and Plastics industry, to expedite the growth of industrial output (Unit Pengurusan Prestasi dan Penyampaian, 2013).

According to the Report of Manufacturing Sector Investigation Survey (2015), in 2014, the highest contributor to Malaysia's gross output of the manufacturing sector is the Petroleum, Chemical, Rubber and Plastic sub-industry at the total of RM307 billion (30.4%); followed by the sub-industry of Electric and Electronic and Optical products at RM232.2 billion (23%). The highest fixed assets value totalling RM74.9 billion (31.2%) is held by the sub-industry of Petroleum, Chemical, Rubber and Plastics products. The Electrical and Electronic and Optical products sub-industry does not hold the highest value of fixed assets, but it records the highest number of persons engaged in the industry at a total of 508,542 persons for the year 2015. This sub-industry also provides the highest salaries and wages, at RMI 7.4 billion.

Table 1.1 demonstrates that sub-sectors Petroleum, Chemical, Rubber and Plastics products are the highest contributors to the manufacturing sector's gross output with the highest value of fixed assets, but owns an average number of person engaged, also average value in salaries and wages. On the other hand, the sub-sector that contributes to the lowest level of gross output namely Beverages and Tobacco products have the lowest value of fixed assets with the least number of person engaged and the lowest level of salaries and wages. This is the opposite to the sub-sector of Electrical and Electronic and Optical products which records the second highest contributor to the gross output, but owns the most number of persons engaged in the manufacturing sector and records the highest level of salaries and wages.

Besides being the main contributor to the growth of national output, the overall manufacturing sector (Petroleum, Chemical, Rubber and Plastics products, Beverages and Tobacco products and Electrical and Electronic and Optical) also plays a significant role in the Malaysian labour market, based on Table 1.1 and 1.2. Table 1.2 shows the number of people employed in various sub-sector.

Table 1.1:
Performance of manufacturing sub-sector, 2014

Sub-sector	Gross output (RM billion)	Value of fixed assets (RM billion)	Number of person engaged	Salaries & wages (RM billion)
Vegetable and animal oils & fats and food processing	201.0	31.5	265,641	6.5
Beverages and tobacco products	9.7	2.9	16,266	0.6
Textiles, wearing apparel and leather products	14.0	4.8	114,418	2.0
Wood products, furniture, paper products and printing	60.6	24.0	350,616	7.0
Petroleum, chemical, rubber and plastic	307.0	74.9	347,179	11.3
Non-metallic mineral products, basic metal and fabricated metal products	116.0	37.9	300,143	8.8
Electric, electronic and optical products	232.2	48.2	508,542	17.4
Transport equipment, other manufacturing and repair	70.8	15.8	193,392	6.5

Source: The Manufacturing Sector Investigation Survey (2015)

Notably, sub-sector of Electric, Electronic and Optical products has the largest number of employment totalling to 508,542 (equal to 24.3% in Table 2) with salaries of RM17.4 billion. The next highest sub-sector is Petroleum, Chemical, Rubber and Plastic, whilst Beverages and Tobacco sub-sector has the lowest number of employed person totalling 16,266 (0.8% in Table 2) with salaries of RM0.6 billion.

For 2014, the total number of workforce in manufacturing sector is 2,096,197 as evidently shown in Table 1.2. This is constituted of 24.3% of the total labour market in all economic sectors in 2014. According to Mohd Noor, Isa, Said, and Abd Jalil (2011), this is due to the absorption of the labour surplus to the manufacturing sector from the traditional sectors.

Table 1.2:
Number of person engaged in Malaysian manufacturing sector, 2014

Sub-sector	Number of person engaged	% person engaged
Vegetable and animal oils & fats and food processing	265,641	12.7
Beverages and tobacco products	16,266	0.8
Textiles, wearing apparel and leather products	114,418	5.5
Wood products, furniture, paper products and printing	350,616	16.7
Petroleum, chemical, rubber and plastic	347,179	16.6
Non-metallic mineral products, basic metal and fabricated metal products	300,143	14.3
Electric, electronic and optical products	508,542	24.3
Transport equipment, other manufacturing and repair	193,392	9.1
Total	**2,096,197**	**100.00**

Source: The Malaysian Manufacturing Sector Investigation Report (2015)

1.2 Labour Market and Job Creation in Malaysian Manufacturing Sector

Generally, the performance of labour market in the Malaysian manufacturing sector is measured according to the employment growth. The use of the employment growth indicator is to see the change in the number of labour force in the sector. If the employment growth is positive, it indicates an increase in the number of labour supply in the sector. If the employment growth is negative, it means a decrease in the number of labour supply in the sector.

Figure 1.1 shows the employment growth in the Malaysian manufacturing sector from year 2005 to 2015. Based on the figure, the growth of employment in the manufacturing sector experienced a decline of 3% growth in 2005 to 2006 but gradually improved from -3% to record a negative growth of 1%. The concept of job creation regards this as a 2% increase in the supply of labour in 2006 to 2007. For example, a firm records 100 employees in February 2015. Then in February 2016, the firm reports 102 employees. The job creation concept explains the increase of two individuals in the firm is as a result of the firm creating two jobs and hiring two new individuals.

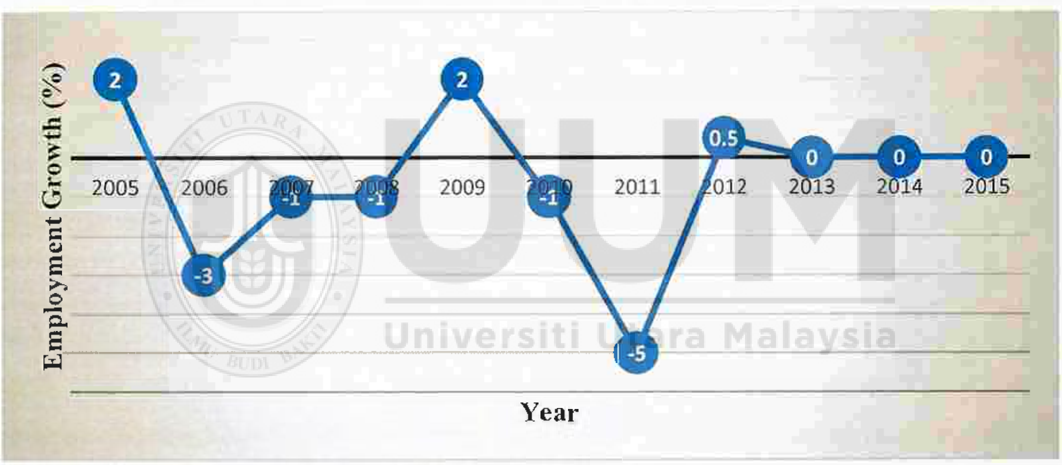

Figure 1.1:
Trend of employment growth in Malaysian manufacturing sector, 2005-2015
Source: Author's calculation

From 2007 to 2008, there was zero employment growth recorded as shown by Figure 1.1. The conventional employment growth regards this as zero increment in the number of labour supply in the economy. On the contrary, the concept of job creation regards this differently. Based on this approach, the measurement of job creation by the firm is under stated.

Steven John Davis and Haltiwanger (1990), Blanchflower and Burgess (1996) and Steven John Davis, Haltiwanger, and Schuh (1996) claim that it is inaccurate to explain job market performance by measuring employment growth. In their study, they explained that the concept of job creation describes employment growth according to the change in the size of industry. Given below are two different examples to demonstrate the description: Scenario (1): A firm that had a total of 20 employees in March 2015 were reported as having a total of 21 employees in March 2016. In the concept of job creation, this is regarded as the creation of one job. In practice, this could mean four individuals leaving the company and five being hired. If the labour market performance is measured by employment growth, it will explain this situation as an increase of one person in the supply of labour force. However, the concept of job creation regards this as the creation of one job (Lawless, 2013).

Scenario (2): A firm that had 20 employees in March 2015 then had 21 employees in March 2016. Practically, this could have involved four existing employees who upgraded their skill and one being hired. If the labour market performance is measured by employment growth, it will regard this as an increment by one person in the supply of labour force. But, the concept of job creation regards this as the creation of five jobs (Steven John Davis & Haltiwanger, 1999).

As noted by Steven John Davis and Haltiwanger (1990), it is important to understand the differences between job creation and employment growth. If job creation is measured based on employment growth, the performance of labour market will be underestimated.

The concept of job creation introduced by Steven John Davis and Haltiwanger (1990) is agreed by Grey (1995) who stresses on the significance of distinguishing between job and employment in the economy. The difference between 'job' and 'employment' is not clearly distinguished. Hence, Grey (1995) defined 'job' as the position at the firm and 'employment' as the labour force who filled the position in the firm. In his study, 'job' reflects the demand for labour, while 'employment' reflects the supply of labour. He claims that the concepts of job and employment are therefore different and the measurement of jobs is frequently overshadowed by the measurement of employment.

The finding of Steven John Davis and Haltiwanger (1990) and Grey (1995) is supported by Stavrunova (2001) who suggests that the concept of job creation is a more appropriate measurement in analysing the performance of labour market because it demonstrates firms' labour demands which are normally hidden by the aggregates and statistics of employment growth.

1.3 Problem Statement

Despite of manufacturing sector being among the sector which record the highest contributor to Gross Domestic Product (GDP), the perplexing issue is whether employment growth in the manufacturing sector actually reflect the rate of jobs created in that sector. To the knowledge of this study, there is hardly any official document that reports the rate of job creation in Malaysian manufacturing sector. Furthermore, confusion arisen due to the different interpretation of the concept of job creation.

This issue is accentuated with the fact that statistical data on job creation by each sub-sector of manufacturing sector are not available in the official report that is Rep0l't of Malaysian Manufacturing Sector Survey issued by the Malaysian Department of Statistics. In addition, there is inconsistency in the manufacturing sector sub-sectors names and codes. This inconsistency complicates the process of calculating job creation, specifically at the sub-sectors level. Apart from the issue of nonexistence and inconsistency, the data are also scatted and not standardized; whether in the system or in printed form. Thus, it is important for this study to calculate the rate of job creation in sub-sector of Malaysian manufacturing sector systematically to allow market players (such as job seekers and firms in manufacturing sector) to get actual and reliable information regarding job creation in Malaysian manufacturing sector

Subsequent problem relating to job creation is that there is an unclear pattern of job creation in the sub-sector of Malaysian manufacturing sector. This is because the current practise used the rate of employment growth instead of the rate of job creation. The point of interest in this study is to analyse the pattern of job creation from the labour demand perspective. However, the rate of employment growth used actually reflect the labour supply perspective (D. S. Hamermesh, Hassink, & Van Ours, 1996). Hence, the goal and the tool of analysis used in the past were contradicting, resulting in giving little explanation about the pattern of job creation that is from the labour demand perspective (firm perspective). Consequently, lack of reliable pattern in job creation hinders practitioners, policy makers, researchers and manufacturing players from doing a more accurate forecast on the trend of job demand and labour supply in this manufacturing sector, particularly in sub-sector, giving the important sector of the economy. Therefore, this study will fulfil the gap by examining the pattern of job creation in the sub-sectors of Malaysian manufacturing sector in terms of persistency, dynamism and magnitude in each sub-sector.

A growing interest among researchers on job creation is in identifying the determinants of job creation. Studies by Ali (2009), Said, Yusof, Mohd Said, and Osman (2010) and Pinn et al. (2011) had identified factors that influence the firm's decision to perform job creation. But their studies used the conventional measurement of employment growth as a proxy of job creation, not the calculated rate of job creation. Another limitation of these studies is that they were published almost more than 5 years ago.

Based on literature review on this area, it is noted also that most of them used basic regression analysis instead of advanced econometric techniques to examine the determinants of job creation. Those determinants that usually used are size, age, and ownership of the firms (Faggio, 2007; Lawless, 2013; Stavrunova, 2001) also output (Ali, 2009; Piva & Vivarelli, 2005; Van Reenen, 1997; Vivarelli, Evangelista, & Pianta, 1996) and wages level (Belzil, 2000; Draca, Machin, & Van Reenen, 2011; Ismail, Bachtiar, Osman, & Noor, 2003; Jackson & Mach, 2009; Pissarides & McMaster, 1990) and economic situation such as transition economy (Bilsen & Konings, 1998; Bojnee & Konings, 1999; Brown & Earle, 2006; Faggio, 2007; Haltiwanger & Vodopivec, 2002; Konings, Kupets, & Lehmann, 2003; Konings, Lehmann, & Schaffer, 1996; Tyrowicz, Velde, & Svejnar, 2016) and economy cycle (Den Butter & Van Dijk, 1998; Dube & Vargas, 2013).

The basic analysis used presents a gap in term of methodology. Presently, there are new methods or technique of analysis which is more robust and comprehensive. An example is Generalized Method of Moment (GMM). In this study, economic variables namely real output, real wages, real assets and real research and development (R&D) expenditure will be tested using more robust method, namely GMM condition to satisfy the methodological gap.

1.4 Research Questions

Based on the issues discussed in the problem statement, this section enlists research questions that need to be assessed, which are as follows:

1. What is the rate of job creation in sub-sector of Malaysian manufacturing sector over 2005-2015?
2. How is the pattern of job creation in sub-sector of Malaysian manufacturing sector over 2005-2015?
3. What are the determinants of job creation in Malaysian manufacturing sector over 2005-2015?

1.5 Research Objectives

Based on the research questions given, this section will describe the research objectives as follows:

1. To calculate the rate of job creation in sub-sector of Malaysian manufacturing sector over 2005-2015.
2. To analyse the pattern of job creation in sub-sector of Malaysian manufacturing sector based on OECD classification of technology level over 2005-2015.
3. To investigate the determinants of job creation in Malaysian manufacturing sector over 2005-2015.

1.6 Scope of the Study

This study attempts to study job creation in Malaysian manufacturing sector within the scope of the research objectives namely calculating rate, plotting the pattern and examining the determinants of job creation in the Malaysian manufacturing sector. This study used secondary data in form of panel data, collected for 11 years from 2005 to 2015, across the 54 industries in the Malaysian manufacturing sector. The data gathered from the Report of Malaysian Manufacturing Sector Survey, published by the Malaysian Department of Statistics (MDOS). The independent variables used in this study are real output, real wages, real assets, and real research and development (R&D) expenditures obtained from the published reports. These variables are used to examine the determinants of job creation in the Malaysian manufacturing sector by using econometric technique. There were no interview or survey involved in this study.

1.7 Significance of the Study

The findings of this study will provide an overview in the performance of the labour market of Malaysian manufacturing sector in the portion of demand for labour. The calculated rate of job creation will be the indicator to the Malaysian labour market performance on the side of demand for labour. Therefore, it will complement the current labour market indicator, namely employment change and unemployment rate, which represent the supply of the labour.

This study also provides information to workers in terms of which sub-sector is currently active in creating jobs and is demanding for workers. It will make job-finding process easier for workers and can save a lot of cost. Also, the process of searching and matching between workers and jobs can be accelerated because workers have enough information about the sub-sector that create jobs that fit their qualifications and skills. Lastly, the group that benefits from this research is the Malaysian government. Since the decision of firms to create jobs is an important element in the labour market, the findings of this study can serve as a guide to policy makers to evaluate the performance of the labour market. Moreover, there is no measurement of the labour market performance that reflect the prevailing demand of labour. The results of this study can be used to address the gaps in the labour market information of the Malaysian manufacturing sector.

1.8 Organization of Study

This study consists of five (5) chapters which are arranged as follows. Chapter One of this study explains the introduction of the study including the background of the study, research problem, research questions, research objectives, scope of the study and significance of the study. Chapter Two of this study reviews the related literature review of job creation consisting of the concepts, the related theory and the empirical findings from the previous studies on job creation.

Chapter Three of this study discusses the methodology used to answer the research objectives. This chapter encompasses the research framework, hypotheses statement, operational definition and measurement of variables, data collection, the job creation model, and the explanation of econometric regression. Chapter Four reports the results of this study based on the research objectives. Finally, Chapter Five is the discussion and conclusion of this study, including limitation, policy implication and recommendation for future studies.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter will discuss the related literature reviews related to this study. Section 2.2 introduces the concept definition, formula and characteristics of job creation used in past studies. Section 2.3 provides discussion on the theories which explain the relationships between job creation and its determinants, Section 2.4 reviews the factors that have been identified to determine job creation in past studies. This chapter ends with an overall summary of the past studies reviewed.

2.2 Conceptual Definition, Formula and Characteristics of Job Creation

This section discusses the development of definition, formula and characteristics of job creation that has been developed by Steven John Davis and Haltiwanger (1990) and other studies such as by Steven John Davis and Haltiwanger (1996), Albak and Sørensen (1998), Haltiwanger and Vodopivec (1999), Ilmakunnas and Maliranta (2003), Faggio and Konings (2003), Hijzen (2007), Haltiwanger, Scarpetta, and Schweiger (2008), Bassanini and Marianna (2009), Lawless (2013) and Voulgaris, Agiomirgianakis, and Papadogonas (2015). Researchers in the labour economics often use the term job as position in firms. This definition and specific measurements of job creation in the labour economics literature were not stated clearly. This gap was filled by Steven John Davis and Haltiwanger (1990) in which the concept of job creation was clearly defined accompanied by specific formula and criteria of job creation. His study however, was focused on the American manufacturing sector.

Steven John Davis and Haltiwanger (1990) defined job creation as the sum of the employment gain in the new or expanding firms in the sector between current time, *t*, and previous time, *t-1*. According to this definition, if the number of jobs in firms does not change, but the number of labour force is changed, the firm is not considered as contributing to the job creation in the economy. Thus, this definition prioritizes change in the number of jobs rather than the change in the number of labour force. In other words, change in the number of jobs determine the size of the firms. As the size of firms is expanding, the number of job creation also increases.

Based on the description above, the formula of (gross) job creation at time *t* is the sum of employment gained over the firm's entrance and expansion between period *t-1* and *t*. Steven John Davis and Haltiwanger (1990) consider the measurement of growth rate (*g*) which describes the expansion and contraction of the industry size. The growth rate (*g*) is important in the formula of job creation because it represents the average number of employment in the firms from period *t-1* to *t*. Therefore, (net) sectoral job creation (JC_{st}) is employment gained at firms (jc_{cst}) divided by the growth rate (g_{cst}) and is expressed in terms of rate.

Steven John Davis and Haltiwanger (1990) claim that the difference between net and gross job creation is that, at the firm level, the change in the number of employees does not include the increase in job creation. Some newly created jobs may not show up as firm-level employment change. In other words, a firm that eliminates a number of jobs and creates the same number of new jobs will not change the total number of employment. For example, if ten clerical jobs are abolished, but ten security jobs are created, the number of employment will still be the same. In this case, ten jobs are created. By this definition, the true level of job creation is understated by the employment change.

Recent studies such as Dunne, Haltiwanger, and Troske (1997), Van Reenen (1997) and Bogliacino and Vivarelli (2012) measure job creation from a different perspective. These researchers define job creation according to the Labour Demand Theory (LDT) that defines labour demand as the total labour demand by firms (represented by the total number of employees) in the sector, at one point of time.

Other studies such as Ali (2009), Krumm and Strotmann (2013), Said et al. (2010), Bojnee and Konings (1999) and Shiferaw and Bedi (2009) define job creation as employment growth. It is derived by calculating job creation as the portion of employee change in firms over the previous total number of employees. The study only takes a positive value of employment growth as job creation.

While, Kerr, Wittenberg, and Arrow (2013), Voulgaris et al. (2015) and Konings et al. (2003) measure job creation as employment gain, which is the positive value of total employees hired during the current year compared to the previous year, in the firms.

Subsequently, Steven John Davis and Haltiwanger (1999) also introduced a pattern of job creation which represented the criteria of job creation based on the study in the American manufacturing sector. These criteria are as follows:

i. **Magnitude**. The magnitude refers to the size of job creation, which is oddly large in sectorial level. For example, a comparable number of jobs is created at a different active sub-sector in the sector over a period of 12 months. If each sub-sector creates an average job of 2%, then the total job creation within 12 months for the entire sector is 24% (2% x 12 sub-sector) (Steven John Davis & Haltiwanger, 1999).

ii. **Persistence**. This pattern relates to job creation at the firm-level. Steven John Davis and Haltiwanger (1999) state that the persistency of job creation at firm-level is more clearly seen than at sectorial-level. It is described as; in period-*N*, the percentage of new jobs created at time *t* must remain at each subsequent date through time *t+N*. To make this clear, consider one active firm that creates 100 jobs in 12 months (March 2014 to March 2015) by increasing employees from 1000 individuals to 1100 individuals. In the subsequent March 2016, and March 2017, the employee evolved as according to one of these three scenarios;

a) 1050 individuals in March 2016 and 1100 individuals in March 2017.

b) 1050 individuals in March 2016 and 1025 individuals in March 2017.

c) 1200 individuals in March 2016 and 1075 individuals in March 2017.

Looking at prior definition, 12 months persistence of 100 newly created jobs from 2015 to 2016 is 50% in scenario (a) and (b), and 100% in scenario (c). The persistent measurement is 0% to 100% in each scenario and a 12-month persistence is about as great as a 24-month persistence (Steven John Davis & Haltiwanger, 1999).

iii. **Concentration**. The concentration of job creation is defined as firms' experiencing a large percentage of employment change. This characteristic relates to the growth rate (*g*) included in the formula of (net) job creation. Whereas, the conventional employment growth, G, is calculated by dividing employment change between period *t-1* to *t*, to the employment at *t-1*. The growth rate for firm's birth and death is between +2.0 to -2.0. Births and rates represent systematic episodes in a firm's cycle of life (Steven John Davis & Haltiwanger, 1999).

iv. **Cyclicality**. This characteristic also shows less cyclical variation in movement. These criteria are usually determined by the economic cyclical situation. For instance, if there is an economic recession during the study period, the cyclicality pattern of job creation tends to fall during the period (Steven John Davis & Haltiwanger, 1999)

2.3 Review of Related Theories

This section discusses related theories that have been used in the literature, which will be used in this research. Discussions started with the theories linked to job creation; that is Labor Demand Theory (LDT) and Creative Destruction Theory (CDT).

2.3.1 Labour Demand Theory

In the context of Labour Demand Theory (LDT), 'labour demand' refers to the maximum amount the firm is willing to pay to get a certain quantity of labour at each possible price over a certain period of time. Therefore, LDT is the theory that links between the likelihood of the level of wages and the amount of labour required by the firm in a given period (D. Hamermesh, 1986; Sudarsono, 2015).

But, according to Knee, Favia, Davis, and Miller (1996), labour demand is determined by the optimal combinations of inputs between wage rate (*w*) per one unit of labour and rental rate (*r*) per one unit of capital. Firms will minimize the cost of input combinations to maximize profit at a certain level of output. The minimization of the input cost is equal to the unit price of output. If the labour wage rate (*w*) is relatively lower than the rental rate (*r*) of capital unit, the firm will adjust the combination of inputs by increasing the use of labour inputs over capital input in the production process. So, firms will increase labour demand at certain level of output. Equation (2.1) represents the function of labour demand.

$$L_D = f\,(w, r, y) \qquad (2.1)$$

Where;

L_D is labour demand

w is wage rate per unit of labour

r is rental rate per unit of capital

y is production level

However, Labour Demand theory (LDT) is extended by the addition of technological factors to the determination oflabour demand, besides the wage rate (w) and the rental rate (r). When an economy is in saturation (usually at developed countries), firms can use technology to minimize cost and maximize profit at certain level of production D. S. Hamermesh et al. (1996). Technology level is determined by the technology cost (a). The Equation (2.2) shows the new function oflabour demand.

$$L_D = f\,(w, r, y) \tag{2.2}$$

Where;

L_D is labour demand

w is wage rate per unit of labour

r is rental rate per unit of capital

a is technology cost

y is production level

If the technology cost (a) is lower than the wages level (w) and capital rental rate (r), firms will adjust the combination of inputs by increasing the use of technology compared to labour and capital. This is called technology-intensive production.

Firms use job creation as a medium to demand for labour, that is, if firms intends to increase labour demand, firms will increase job creation, and otherwise. So, factors affecting firm's decision to demand for labour is also affecting firm's decision to create jobs. Based on the description above, Labour Demand Theory (LDT) is suitable to use as an underpinning theory in the study of job creation.

2.3.2 Creative Destruction Theory

As explained earlier, Labour Demand Theory (LDT) does not consider innovative variable as a factor of labour demand. Therefore, Schumpeter (1942) introduced Creative Destruction Theory (CDT) which regards innovation as one of the factors affecting a firm's decision to create jobs when the economy is static. Solow (1957) claimed that production is more influenced by innovation level rather than being affected by capital accumulation or number of labour. Through innovation, firms tend to acquire labour through job creation. Creative Destruction Theory (CDT) states that innovation also destructs irrelevant jobs in the firm or sector.

Da Silva (2010) further explained that during static economy, the condition of labour and output declined; therefore, one of the best methods to boost economic growth and production is through innovation. As purported by Creative Destruction Theory (CDT), through innovation, employers create jobs that require innovative and skilled labour, which in return boosts production and economic growth. Firms are able to reduce production costs and at the same time increase output.

Since Creative Destruction Theory (CDT) introduces innovation as one of the determining factors on labour, this theory is included in this study although there are insufficient studies that prove empirically the impact of innovation on job creation.

2.4 Empirical Review of Job Creation

This section reviews the empirical literature related to job creation. On the reviews of job creation started with reviews on the pattern of job creation. Subsequently, the empirical evidences in the literatures relating to the determinant factors of job creation are discussed.

2.4.1 The Pattern of Job Creation

Previous studies on the pattern of job creation were carried out in various countries such as in the Three- Developed Countries (Garibaldi, 1998), Slovenia (Bojnee & Konings, 1999), Ukraine (Stavrunova, 2001), Five-Transition Countries (Faggio & Konings, 2003) and Australia (Mitchell, Myers, & Juniper, 2005). These studies used descriptive analysis to analyse the pattern of job creation in their respective countries. The results were analysed in accordance with the basic criteria of job creation as introduced by Steven John Davis and Haltiwanger (1999) namely persistency, consistency, magnitude and cyclical.

Garibaldi (1998) conducted a comparative study to analyse the pattern of job creation in three developed countries, namely United States, United Kingdom and Canada. The study examined the pattern of job creation in respond to the economic cycle using descriptive analysis. It is found that the pattern of job creation in these three countries fulfils the cyclical criteria of job creation. When the economy is at peak, the magnitude of job creation is large. If the economy is in contraction, the magnitude of job creation is small.

This finding is supported by a research conducted in Australia by Mitchell et al. (2005) to analyse the pattern of job creation in accordance to the economic cycle. The method used to achieve the objective of the study is descriptive analysis. The findings satisfy the cyclical criteria of job creation pattern, in line with studies done in the US, UK and Canada. Similar to Garibaldi (1998), job creation rate in Australia was high during the economic expansion, but lower when the economy was declining.

Apart from analysing the pattern of job creation in accordance to economic cycles, the pattern of job creation was also studied by looking at the economic transition. Bojnee and Konings (1999) conducted a study in Slovenia using analysis descriptive method. In contrast to the result in Poland, the study found that at the beginning of the transition process, the pattern of job creation in terms of magnitude was found to be lower than at the end of the transition process. This study suggests that at the beginning of the transition process, the magnitude pattern of job creation was low due to the decline in the demand for labour in state-owned firms. At the same time, growth of new private firms and *de novo* firms were too slow to support the economy's transition process.

The study conducted in Slovenia by Bojnee and Konings (1999) complements the results obtained from a study in Estonia conducted by Haltiwanger and Vodopivec (2002) that aims to assess the magnitude pattern of job creation during the transition process of giving the firm ownership. The result from descriptive analysis shows that during the initial phase of the transition process, the magnitude pattern of job creation was lower than at the end of the transition phase. The study added, the magnitude pattern of job creation in Estonia was converging into the magnitude pattern of job creation in western economies towards the end of the transition process.

Such study was done by Jackson and Mach (2009) in Poland during 1988 to 1998 period of economic transition. The study used descriptive analysis method to analyse the pattern of job creation in terms of magnitude, based on the firm ownership. The results showed that the magnitude of job creation in Poland at the beginning of the economic transition process was higher than at the end of the transition process. During the beginning of the transition process, the result showed that there was an increase in demand for labour by the private firms and state-owned enterprise. This finding is opposite to the earlier studies at Estonia and Slovenia.

In summary, from the reviews above, the pattern of job creation were analysed using the method of descriptive analysis. The results showed a variation of findings. The studies which examine the cyclical pattern of job creation as a response to the economic cycle support Labour Demand Theory (LDT). On the other hand, the findings of the studies that examine the pattern of job creation in the transition countries such as Poland, Estonia and Slovenia are varied.

2.4.2 Determinants of Job Creation

The Theory of Labour Demand assumed that output, wages and capitals affect the firm's decision to demand for labour through job creation. Given the concept of job creation is often used as a demand for labour force, such factors as output, wage and capital are also found to affect job creation.

2.4.2.1 The Relationship between Output and Job Creation

Studies show that a firm's decisions to create jobs are affected by the output, and the effect is indirectly caused by the current economic situation in the country.

Steven John Davis, Haltiwanger, and Schuh (1998) conducted a study on the American manufacturing sector to examine the relationship between outputs on job creation in the manufacturing sector based on the country's economic cycle from 1940 to 1990. According to the econometric method used, namely Vector-Auto Regression (VAR), this study proved that when the American economy was in contraction, it caused the output of manufacturing sector to contract too. The circumstances do not encourage firms to create jobs as a step to minimise cost and to maximise profit. The research concluded that the sector's output has a positive relationship to job creation in the American manufacturing sector.

Later, another study was conducted in the Czech Republic and Estonia by Jurajda and Terrell (2003) aimed at investigating the effect of output on job creation. This study measures the output that was affected by the transformation process in the countries. It assumes the expanding of output level occurring at the beginning of the transformation process that encourages firms to create jobs. The method of descriptive analysis applied demonstrate a significant positive relationship between the output level and job creation in both countries. However, this study did not classify firms according to their demographic features. Therefore, the results have not been able to explain further on the characteristics of firms that promote output and job creation in both countries.

A study conducted in Russia by Brown and Earle (2002) aims to examine the effect of output expansion on job creation. This study determines that the expansion of output is due to the Russian transformation programme in year 1992. This study used census data for medium- and large-sized firms, and divided the study period into two groups, which are i) the pre-transformation period (from 1985 to 1992) and ii) the post-transformation period (from 1992 to 1999). This study is based on the Creative Destruction Theory (CDT). The CDT suggests that at the beginning of the transformation process, expansion in the output production encouraged firms to create more jobs. The descriptive analysis used in the study discovers that during the early phase of the transformation process, specifically after 1992, there was an increase in the magnitude of job creation, compared to before the pre-transformation period. This study concluded that the transformation programme in Russia has been promoting aggregated demand in the economy and encouraging firms to expand the size of the operation and to increase their production output. The study found that rising the output production encouraged firms to create jobs, so the production process will not be disrupted.

In the scope of Malaysian manufacturing sector, a study was carried out by Ali (2009) to examine the relationship between outputs on job creation. While Steven John Davis et al. (1998) measure output based on the economic cycle, and Brown and Earle (2002) measure output based on the economic transformation; this study measures output based on the wealth of the selected region that is the Western region and the Eastern region of Malaysia. The study hypothesized that the demographic factors of western region such as easy access on facilities, infrastructure and investment prompt the regional output level. The Shift Share Analysis method used in this study showed that the regional output has a significant positive relationship on job creation in the Malaysian manufacturing sector. The magnitude of job creation in western region was higher compared to the eastern region in Malaysia.

A study that was conducted in the Republic of Ireland by Lawless (2013) analysed the effect of output on job creation. This study measured the level of output on the economic cycle that is during the economic contraction known as Crisis.com in 2001-2003. According to the descriptive analysis used in this study, the findings turned out to be in contra to the study by Steven John Davis et al. (1998). In the case of the Republic of Ireland, even though during the economic turndown that led to the decline in the output level, the magnitude of job creation is high. This result showed that firms continuously create jobs, regardless of the economic cycle, in order to control the unemployment level in the economy.

Voulgaris et al. (2015) conduct a study in the Greece manufacturing sector to examine the effect of output through economic cycles on firm's decision to create jobs. This study found that a period of economic contraction (post-crisis period), has prompted the firm to shrink their output level. As a result, firms also decrease their demand for labour by decreasing job creation. This study concluded that the relationship between output and job creation is positive, in which any disruption to output will also disturb the firm's decision to create jobs in the Greece manufacturing sector.

2.4.2.2 The Relationship between Wages and Job Creation

Based on past studies, job creation is affected by wage level. For example, a study by Klein, Schuh, and Triest (2003) investigated the relationship between the level of wages on job creation in the American manufacturing sector from year 1973 to 1993. Using the simple OLS regression, this study found a significant relationship of wage level on job creation. But, contrary to the general finding, the study found that the increase in wages level lead to an increase in labour costs. Therefore, firms will reduce labour costs through a reduction in job creation.

Further to that, a study by Camacho-Cabiscol (2003) assessed the impact of wage level on job creation in the Catalonia manufacturing sector in year 1996. This study also used descriptive analysis by dividing the firms into two groups: i) high level wages and ii) low level wages. This study found that there is a positive correlation between wages and job creation, but in different magnitude depending on the wage level. If the firm is in the low level wage group, the magnitude of job creation is bigger, compared to the firms in the group of high wage level.

However, a study by Flinn (2006) discovers unclear relationship between the implementation of minimum wages on job creation. This study suggests that the implementation of minimum wage will reduce the demand for labour as a result of an increase in the marginal cost of hiring new workers. The decrease in the demand for labour reflects a decrease in the job created by firms. In other words, minimum wages will reduce job creation in the economy. On the other hand, this study also adds that the implementation of minimum wage reduces the gap between the expected returns from work and being unemployed. It depends on the effort of the unemployed to find a job. For instance, if the unemployed person increases his or her effort in searching for jobs, the minimum wage will increase the rate of job creation. However, if the effect of demand for labour by firms is more dominant if compared to the effect of labour supply, the increase in the minimum wage would reduce job creation.

A study conducted in the Swedish manufacturing sector by Heyman (2008) had the objective to examine the relationship between the degree of elasticity of wages on job creation as one of job reallocation. The result of this study was different from the results of both studies by Klein et al. (2003) and Flinn (2006). The result shows insignificant relationship between wage and job creation in the sector. But, the reason for difference in the result is because this study uses the degree of flexibility of wages on job creation, instead of the implementation of the minimum wages on job creation in the sector.

Interestingly, a study in the United States by Meer and West (2015) applied different approach than descriptive analysis used in past studies. The different approach was state fixed effect and specific time trend, and region by time period effect. Although this study measured job creation as employment growth, the result supports one of the findings by Flinn (2006). This study found that there is an inverse relationship between the minimum wage and job creation. This study explained that the implementation of the minimum wage reduces job creation, specifically in the young and new firms.

2.4.2.3 The Relationship between Capital and Job Creation

Job creation is not only influenced by the level of wages and output, but also by capital. How capital affects job creation is dependent on its role in the firms, whether it complements or substitutes to the workers. As explained by Labour Demand Theory (CDT) if the capital is substitute for workers, firms will replace labour by capital, so job creation will decrease. Meanwhile, if the capital is complement to the workers, firms will increase job creation (Draca et al., 2011; Falk & Koebel, 2004).

Skuras, Dimara, and Stathopoulou (2003) measures the link between capital and job creation. The study was conducted on 83 firms in the Aegean and Ionian Islands using capital subsidy and asset as the measurement of the capital. It finds a significant negative relationship between subsidy capital and asset to job creation. Capital subsidies have reduced the average cost of production, resulting in increased firm profitability. Higher profit encourages firms to increase purchases of assets and machines in order to increase the production of output. Assets and machines in the production process have replaced the function of labour in the production process.

Hence, the demand for labour decreases because firms do not create jobs anymore. In this case, subsidies, capital, and asset are the replacements to the workers in the economy. Giving subsidies was initially the government's motive to reduce unemployment and boost job creation in the economy. But, in this study, it turned out that the assets and machines became substitutes to the workers; the increased use of assets and machines has reduced job creation and therefore has failed to achieve the government's objective.

Gómez-Salvador, Messina, and Vallanti (2004) conducted a study in 13 European countries using the analysis by characterizing firms based on capital intensity and divided the sample into several groups, namely; i) k-intensity below 20%, ii) k-intesity between 20%-30%, iii) k-intensity between 30%-40% and iv) k-intensity above 40%. However, the number of firms in each group was not clearly stated. Yet, the finding of the descriptive analysis showed that firms with capital intensity of below 30% exhibited negative relationship on job creation, while firms with capital intensity of above 30% showed positive correlation on job creation. This means that, firms having a capital intensity of less than 30%, increased their demand for labour through job creation because labour is the substitute to capital in their production process. In other words, their production process is labour-intensive. Meanwhile, the demand for labour through job creation has increased among firms that have a capital intensity of greater than 30% because they used both capital and labour together in the production process.

Another study, conducted by Shiferaw and Bedi (2009) focusesd on the Utopian manufacturing sector from 1996 to 2007. The purpose of this study is to investigate the contribution of capital on the firm's decision to create jobs in the sectors involved. It divides firms in the manufacturing sector into two group, namely i) labour-oriented firms and ii) capital-oriented firms. This study defined labour-oriented firms as firms that have a high proportion of labour than capital in their production process, while capital-oriented firms are defined as firms that have a high proportion of capital than labour in their production process. The outcome of this study demonstrated that capital-oriented firms contribute up to over 50% of job created in the sector. In other words, the Utopian manufacturing sector uses capital and labour together in their production process.

Another study by Kongolo (2010) is conducted in the Southern African Region to analyse the relationship between capital subsidies on job creation using a descriptive analysis on firms in the small- and medium-sized industries that receive capital subsidies in the production process. The purpose of the capital subsidy is to help firms reduce production costs and ensure the profitability of the firms. The results of the study show that the subsidy has increased the profitability of the firms and increase the production of output. The increase in the production of output led to the firms needing more labour in the production process, resulting in firms increasing job creation. This is in line with the characteristics of firms in the small- and medium-sized industries which are labour-intensive in the production process. Therefore, capital subsidies have shown a positive relationship to job creation. The goal of capital subsidies to reduce unemployment in the economy is achieved.

2.4.2.4 The Relationship between Research &Development (R&D) Expenditure and Job Creation

Creative Destruction Theory (CDT) suggests that besides other variables such as output, wages, and capital, innovation is also one of the determinants for a firm's decision to create jobs. A number of previous studies have been conducted such as Alonso-Borrego and Collado (2001), Piva and Vivarelli (2005), Said et al. (2010) and

Bogliacino and Vivarelli (2012) in various countries with the aim to investigate the relationship between innovation and job creation.

The study conducted by Alonso-Borrego and Collado (2001) proposed to inquire on the influence of innovation on a firm's decision to create jobs in the Spanish manufacturing sector. The study collects and divides the data of firms in the manufacturing sector into two groups: i) a group of innovated firms and ii) a group of less innovated firms, from year 1990 to year 1997. The study measures innovation based on the time taken by firms to implement the innovations. A firm is included in the group of innovated firms if it is able to carry out innovations in the production process within the period of four months. While a firm is considered as a less innovated firm if it is takes a longer period to implement innovation in the production process. The result of this study suggests that the innovated firms contribute to a higher magnitude of job creation than less innovated firms in the sector. This is applicable Spain manufacturing sector because firms there implement labour-friendly innovation types in the production process to ensure increase in the output level as well as to maintain the unemployment rate in the country.

One research conducted by Piva and Vivarelli (2005) studies the relationship between innovation and the firm's decision to create jobs. This study was conducted in Italy over the past 6 years, from year 1992 to 1997. This study measures innovation as growth in the value of innovation in 318 firms in the manufacturing sector in Italy. Despite of using descriptive analysis, this study uses econometric techniques known as Generalized Method of Moment (GMM) estimator to identify the type of relationship between innovation and job creation in the sector. The analysis suggests complementary relationship between innovation and job creation in the Italian manufacturing sector. A positive growth in the value of innovation encourages firms to increase job creation at the firm level if the innovation and labour force are being used together in the production process. This result is true regardless of the firm's demographic features such as size, age and ownership of the firms. So, a firm's decision to create jobs is not influenced by the characteristics of firms, but by the types of innovation used. In this case, the types of innovation used in the Italian manufacturing sector is categorized as labour-friendly.

An interesting study conducted by Bogliacino and Vivarelli (2012) in 16 European countries from year 1996 to 2005, focused on 25 industries in the manufacturing and services sector. This study measures innovation as a development and upgrading of technology in the production process in both sectors. The result of this study shows the demand for labour increases upon the improvement of technology in the firms. The improvement of technology encourages firms to create jobs equivalent to the technology level, so that the technology can be used optimally. In conclusion, this study determines positive relationship between innovation and job creation in 16 European countries. Furthermore, technology is used together with labour force in the production process in both sectors.

In another view, a research conducted by Said et al. (2010) studies the types of relationship between innovation and jobs creation in the Malaysian manufacturing sector. In contrast to previous studies such as Alonso-Borrego and Collado (2001) and Piva and Vivarelli (2005) that measure innovation based on growth of innovation and period of implementing the innovation, this study uses Research and Development (R&D) expenditure to represent innovation. The method of Generalized Method of Moment (GMM) regression is applied and results show a significant negative correlation between R&D expenditure on the 2nd lag job creation. This study determines that the types of innovation used in the Malaysian manufacturing sector is a substitution to the labour in production process. High R&D expenditure encourage firms to shift from labour to innovation in order to increase production level. Therefore, this study forecasted that Malaysia will face higher unemployment rate if the situation is permanent. So, this study suggests that Malaysia need to review the types of innovation used in the production process to ensure that the unemployment rate is under control.

2.5 Chapter Summary

This chapter has reviewed some concepts, measurements and patterns of job creation that have been used in past studies. From the reviews, there were some gaps for example, in the definition and computation of job creation. Unlike most of the past studies, this study used the formula introduced by Steven John Davis and Haltiwanger (1990). The formula considers sub-sector growth size in the calculations of job creation, but does not take into account the growth of employment. This chapter also reviews the main the focus of this study namely patterns, theories and determinants of job creation. The concept of job creation used in the literatures serves as a foundation for this study to build a research framework and hypotheses. Furthermore, the reviews of the concept of job creation enabled the researcher to identify the appropriate variables to be applied in the present study.

CHAPTER THREE

DATA AND METHODOLOGY

3.1 Introduction

This chapter is divided into several sections. Section 3.2 introduces the research design of this study including data collection, operational definition and measurement of the variables. Consequently, Section 3.3 describes the research framework of this study, followed by the hypothesis statement in Section 3.4. After explaining about hypothesis statement, the calculation of job creation rate is elaborated in Section 3.5. Section 3.6 provides an explanation on the descriptive analysis used to analyse the pattern of job creation. Lastly, the estimation procedure of dynamic panel data model to investigate the determining factors of job creation, is describe in Section 3.7. This chapter ends with a summary of the data and methodology used in this study.

3.2 Research Design

This study was conducted using quantitative research methods. A quantitative study is essential for providing statistical descriptions, relationships and explanations. It is also providing numerical data for examining relationship between independent variables to dependent variable (McMillan & Schumacher, 2014).

3.2.1 Data Collection and Data Collection Procedure

In accordance to the quantitative research methods were used to answer the research questions, the data collected was a set of secondary data obtained from the Annual Manufacturing Sector Survey Report released by the Malaysian Department of

Statistics, was also used as it is presented the performance of major indicators of the Malaysian manufacturing sector. The Economic Report released by the Bank Negara Malaysia was also used in this study, aims to ensure that the data used is accurate.

The cross-section data and time series data were combined to form a set of panel data. Panel data used in this study took into account 54 industries groups in Malaysia's manufacturing sector for a period of 11 years, from 2005 to 2015. The selection of industry groups is based on the Malaysian Industrial Standard Classification (MSIC) 2010.

3.2.2 Operational Definition and Measurement of Variables

Data on the number of employees, real outputs, real wages, real assets, and real research and development (R&D) expenditure with regard to the Malaysian manufacturing sector are used to achieve the objectives of the study. The real output, real wages, real assets and real R&D expenditure data represent the independent variables, whereas data on the number of employees are used to calculate the rate of job creation, which represent the dependent variable. Description of the operation definition and measurement of other variables are stated in Table 3.1.

In contrast to the earlier studies, the data of employees are the basis for the calculation of job creation in this study to obtain the rate of job creation (RO1). Researcher uses the formula developed by Steven John Davis and Haltiwanger (1990). This formula is also used by Bojnee and Konings (1999), Acs and Armington (2000), Stavrunova (2001), Faggio and Konings (2003), Mitchell et al. (2005) and Fuchs and Weyh (2010). The explanation of the formula is discussed further in the Section 3.5.

Table 3.1:
Operational definition and measurement of selected variables

Variables	Symbol	Definition
Job creation	JC_{st}	Job creation as the dependent variable is calculated based on the formula developed by Steven John Davis and Haltiwanger (1990). The formula will be explained further in the Section 3.5.
Real output	Ry_{st}	The value of gross output sector is defined as the value of manufactured products are produced in Malaysia Ringgit, (RM '000) divided by the price level (2010=100). The study by Bogliacino and Pianta (2010) used the same definition.
Real wages	Rw_{st}	Wages refer to gross emoluments paid to employees during the reference year before deduction of employee's contribution to Employees' Providence Fund (EPF), Social Security Schemes or any other deduction in terms of Malaysia Ringgit (RM). It is divided by the price level (2010=100). Studies such as Van Reenen (1997), Piva and Vivarelli (2005) used the same definition of level wages.
Real assets	Ra_{st}	Fixed asset is referred to either tangible or intangible, new or used, which has a normal economic life span of more than one year. It is the net worth after deducting depreciation in Malaysia Ringgit (RM '000) and divided by the price level (2010=100). A number of studies such as Uppenberg and Strauss (2010) used the same variables in their studies.
Real R&D expenditure	$Rr\&d_{st}$	R&D expenditure variable consists of expenditure on the process and techniques of producing output in Malaysian Ringgit (RM '000). It is divided by the price level (2010=100). Pritchett, Poverty, and Division (1996), Becker and Dietz (2004), Isom and Jarczyk (2009), Bogliacino and Pianta (2010) and Lachenmaier and Rottmann (2007) used the same definition in their studies.

3.3 Research Framework of the Job Creation

This study establishes a theoretical framework based on Labour Demand Theory (LDT) and Creative Destruction Theory (CDT). Both theories are the most well-known theories associated with job creation. Based on these theories, variables such as output, wages, capital and innovation has been identified and were tested to determine the factors that influence job creation.

Labour Demand Theory (LDT) postulated that labour demand by firms is done through job creation and it is influenced by output performance. The output, in other words, encourages firms to demand for employment through job creation. Therefore, the output affects job creation positively. On the other hands, this theory illustrates a negative relationship between labour demand through job creation and wage levels. In this context, the level of wages is the cost per unit of labour being employed. High wage levels will cause firms to reduce labour demand through the reduction in job creation. Hence, wage levels affect job creation negatively.

Innovation is a variable found to have a direct positive impact on job creation, according to the Creative Destruction Theory (CDT). One of the innovation elements in the context of Malaysian manufacturing sector is research and development expenditure (R&D). R&D expenditure affects job creation positively (Alonso-Borrego & Collado, 2001; Bogliacino & Vivarelli, 2012; Piva & Vivarelli, 2005).

According to Steven John Davis and Haltiwanger (1999) one of the job creation pattern is dynamic, in which job creation at one entity at current time is influenced by the job creation within the entity at least at the previous year. As such, the research framework of this study is supplemented by a new variable of lag(1) job creation.

Based on the explanation earlier, Figure 3.1 illustrated the research framework of this study on job creation in the Malaysian manufacturing sector. The variables namely real output, real wages, and real assets are selected based on the Labour Demand Theory (LDT). On the other hand, the variables such as real R&D expenditure is extracted from the Creative Destructive Theory (CDT). The new variables introduce in this research framework is lag variable *(t-1)* for job creation and for R&D expenditure.

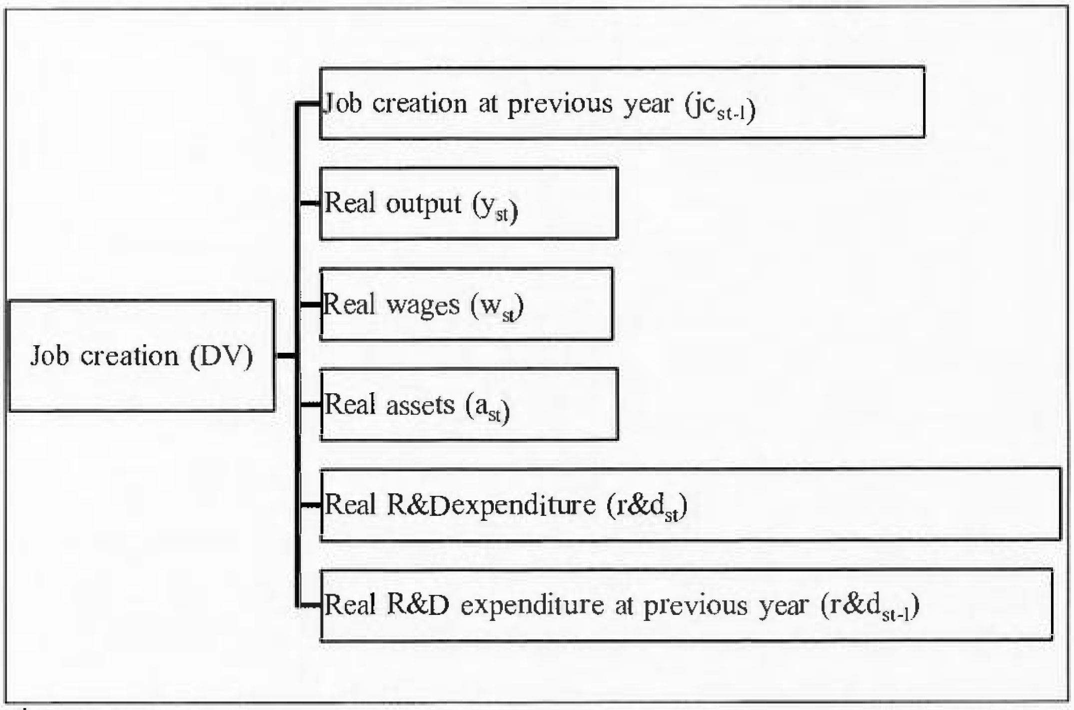

Figure 3.1:
Research framework of determinants of job creation in Malaysian manufacturing sector

The model is mathematically express as:

$$JC_{st} = \alpha_{st} + \beta_1 JC_{st-1} + \beta_2\, ry_{st} + \beta_3 rw_{st} + \beta_4 ra_{st} + \beta_5 rr\&d_{st} + \beta_6 rr\&d_{st-1} + \varepsilon_{st} \tag{3.1}$$

3.4 Calculation of Job Creation

This section explains in greater detail the adaption of the formula developed by Davis and Steven John Davis and Haltiwanger (1990) to calculate job creation in the context of Malaysian manufacturing sector. The steps are as follows;

Firstly, calculate the total change in the number of employees at firm's level. However, in the case of Malaysia, there is no available data on the number of employees at the firms' level reported in the Report of Manufacturing Sector Survey. Therefore, this study used the data on the number of employees at the sub-sector level in the manufacturing sector. The formula is as follows;

$$x_{est} = x_{e \in st} - x_{e \in st-1} \quad (3.2)$$

Where

x is the number of employees

subscript e represents industry in the sub-sector

s is the sub-sector

t represents current time

Secondly, calculate the sub-sector size, z_{st}, is the average of employment in period t and $t-1$, as follow:

$$Z_{st} = 0.5\ (x_{st} + x_{st-1}) \quad (3.3)$$

And the corresponding sub-sector level employment growth rate is

$$g_{st} = \frac{X_{st} + X_{st-1}}{2} \quad (3.4)$$

Where

X denotes the employees

subscript s denotes of sub-sector

t is refers to current time

The growth rate represents the size of the sub-sector in the manufacturing sector.

Lastly, calculate the rate of job creation at sub-sector by dividing the sum of positive employment gained (Eq 3.2) by the growth rate (Eq 3.3), as follows;

$$JC_{s\,t} = \sum_{+st} \frac{x_{est}}{sg} \quad (3.5)$$

Where

JC_{st} denotes the rate of job creation in sub-sector

x_{est} is employment gained at sub-sector

g_{st} is growth rate at sub-sector

The rate obtained was used to plot a graph as to answer the second research question.

The results on calculation of job creation rate on 54 industries are divided into 11 sub-sectors referring to the Malaysian Manufacturing Survey Report (2016). These 11 sub-sectors are, 1) Food, Beverages and Tobacco, 2) Textile, Clothing, Leather apparel and Footwear, 3) Wood, Furniture, Paper and Printing, 4) Optical, Media and Photography, 5) Petroleum and Chemical Product, 6) Non-metallic and Fabricated Metal, 7) Machinery and Equipment, 8) Fibre Products, 9) Electric and Electronic, 10) Automotive and Transportation, 11) Other Manufacturing

3.5 Descriptive Analysis of the Pattern of Job Creation

This section described how the pattern of job creation in the sub-sector of Malaysian manufacturing sector was derived. This research used the calculated rate of job creation to plot the graph and illustrated the pattern of job creation in the sub-sector of Malaysian manufacturing sector using line graph. To simplify the analysis, sub-sector was grouped based on the Report of Malaysian Manufacturing Sector Survey (2015) and OECD classification of technology level.

Then the analysis of job creation pattern in the sub-sector was done based on the characteristics of job creation, developed by Steven John Davis and Haltiwanger

(1999). The characteristics included magnitude and persistency. This task is to achieve the second objective of this study.

3.6 Estimation Procedure for Determinants of Job Creation in Malaysian Manufacturing Sector

The estimation method that is used in this study was to achieve the third objective, that is the identification of the determinants of the job creation Malaysian manufacturing sector. The estimation method used was divided into two, namely i) the static model estimation procedure and ii) the dynamic model estimation procedure. Both estimation procedures are in line with the data panel used in this study.

3.6.1 Specification of the Model for Determinants of Job Creation

Before conducting the estimation procedure, this study needs to formulate an appropriate model of job creation to answer the third research question of the study. So, this study formulates the specification model of determinants of job creation in the Malaysian manufacturing sector based on the research framework as discussed in Section 3.1.

Based on the research framework, the underpinned model is based on the general function of labour demand where demand for labour by firms is dependent on the wages level, capital and output, as shown below;

$$L_D = f\,(w, r, y) \tag{3.6}$$

Where;

L_D is labour demand

w is wages

r is capital

y is output

Equation (3.6) was the basic model of determinants of job creation. According to some researchers, such as D.S. Hamermesh et al. (1996), Klein et al. (2003) and Mumford and Smith (2004), labour demand and job creation are similar, therefore formulating the specification model for the basic function of job creation was also similar to the basic function of labour demand.

However, this study undertakes some modifications on basic functions (Eq 3.6) by incorporating research and development (R&D) expenditure as an additional factor affecting job creation, as described in the Creative Destruction Theory (CDT). So, the modification functions of job creation is as follows;

$$JC_{st} = f\ (y_{st}, w_{st}, a_{st}, r\&d_{st}, r\&d_{st-1}) \quad (3.7)$$

Where;

JC_{st} denotes job creation in the sector

y_{st} is real output

w_{st} refers to real wages

a_{st} is real assets

$r\&d_{st}$ is real research and development (R&D) expenditure

$r\&d_{st-1}$ is the real R&D expenditure in the previous year

Subscript s is sub-sector in the manufacturing sector and t is current time

Equation (3.6) was also used as a static model in static estimation procedure in this study.

The static of determinants of job creation is an extension of the basic function of job creation. Job creation as the dependent variable, while real output, real wages, real asset, real R&D expenditure and real R&D expenditure in the previous year are the factors that determine job creation in the sector. It is written as follows;

$$JC_{st} = \alpha_{st} + \beta_1 y_{st} + \beta_2 w_{st} + \beta_3 a_{st} + \beta_4 r\&d_{st} + \beta_5 r\&d_{st-1} + \varepsilon_{st} \tag{3.8}$$

Where

JC_{st} denotes job creation in the sector

y_{st} is real output

w_{st} refers to real wages

a_{st} is real assets

$r\&d_{st}$ is real R&D expenditure

$r\&d_{st-1}$ is R&D expenditure in the previous year

Subscript s is sub-sector in the manufacturing sector and t is current time

3.6.2 Estimation Procedure

This section discussed the diagnostic tests performed on the panel data to ensure that the data used is permitted. This study used short panel data where the cross-sectional unit (N) is greater than time-series unit (T). So, only a few diagnostic tests are required, namely, Multicollinearity test, Heteroscedasticity test, Serial correlation test, Pooled Ordinary Least Square (POLS), Random Effect (RE) and Fixed Effect (FE). These three tests are performed to ensure that the data used do not affect the regression result in later analysis. Further explanation of each diagnostic test would be described in the next section.

(i) Multicollinearity Test

Multicollinearity is the first diagnostic test required on the data. Multicollinearity is the criteria or characteristic shown by the data in linear model. To test, samples are taken. While one sample might show multicollinearity, the other sample(s) might present no multicollinearity.

Multicollinearity exists when independent variables are linearly correlated to other independent variables. A change in one unit of independent variable, X_{1st} will change the independent variable, X_{2st}. In this case, it is difficult for the estimation process to take place in differentiating coefficient slope of independent variable, X_{1st}, (β_1) and independent variable, X_{2st}, (β_2). Although, the estimator is able to calculate the values of β_1 and β_2, some problems will still exist during estimation.

The situation where the estimators of all or some independent variables in the model are fixed but not all are equal to zero, simultaneously, is known as perfect multicollinearity. It is described by the following equation;

$$\delta_1 X_{1st} + \delta_2 X_{2st} + \ldots + \delta_k X_{kst} = 0 \quad (3.9)$$

Perfect multicollinearity is where, $\delta_1 X_{1st}$, $\delta_2 X_{2st}$, … , $\delta_k X_{kst}$ is constant, in which not all are equal to zero, simultaneously. Imperfect multicollinearity is where the one independent variable, X_{kst}, is correlated but imperfect, as shown below;

$$\delta_1 X_{1st} + \delta_2 X_{2st} + \ldots + \delta_k X_{kst} + v_i = 0 \qquad (3.10)$$

Where

v_i is statistical error

δ_2 is not equal to zero

So, Equation (3.9) shows independent variable, X_{2st} as perfectly correlated with another independent variable. The correlation between X_{2st} is tied to the value of one. If the multicollinearity issue is not corrected, it will affect the model estimation in ways such as;

1) Increasing in standard error estimator. Independent variables which form the multicollinearity will contain the same information and tend to form the trend together. This causes the estimator to be inaccurate, increasing the probability of the estimator to be distant from the true value. If the multicollinearity is perfect, the coefficient estimator may end up with the opposite sign.
2) Statistic value, t, of two or more of the independent variables tend to be smaller, as consequences of the increase in the value of standard error.
3) Perfect multicollinearity cause change in the model specification. This change will cause the estimator's value to be much different.

Therefore, in order for the result of the estimation process to be accurate, the multicollinearity issue needs to be remedied. The Variance Inflation Factors (VIF) technique is used to detect multicollinearity issue in accordance with the scope of this study. The VIF interprets how much the variance of the estimated regression coefficient, β, is inflated by the existence of correlation among the predictor variables in the model. The VIF value of 1 indicates no correlation among the k_{st} predictor and the remaining predictors' variables. Thus, no inflation in the independent variable of β. If the VIF value is between 1 and 5, there is moderate correlation and requires further investigation. Consequently, the predictors are highly correlated and needs remedy if the VIF value is greater than 5 (Hair, Ringle, & Sarstedt, 2011).

(ii) Heteroscedasticity Test

The second diagnostic test is heteroscedasticity test. Heteroscedasticity problem is the opposite of homoscedasticity issue. Homoscedasticity shows regression disturbance in the same variance across time series and cross-sectional units while heteroscedasticity looks at the regression disturbance that may present different variance across time series and cross-sectional unit. This problem is found in the panel data, where the cross-sectional unit is larger than time series unit (N>T).

Heteroscedasticity needs to be remedied because it may result in inefficient but consistent regression coefficient and may cause bias in the value of standard error. Since the number of industries is larger than the number of time series in this research, this test should be conducted. The problem of heteroscedasticity should be eliminated using robust standard error correcting estimation.

Baltagi, Bresson, and Pirotte (2005) derive a joint Lagrange Multiplier (LM) test heteroscedasticity model under hypothesis null is error component in the model is homoscedastic. In the case of panel data, it is likely to be heterogenic across the cross-sectional unit that would present heteroscedastic in error component.

Later on, assuming homoscedasticity behaviour of the reminder error term, Baltagi et al. (2005) derived the LM test against null hypothesis of homoscedasticity of the individual random effect. The joint LM test was conducted well, as proven by the Monte Carlo Experiment. The error component was heteroscedastic. In contrast, the marginal LM tests was performed well when heteroscedasticity was in the right error component. Should the heteroscedasticy existed in the false error component, the model would have generated misleading results.

(iii) Serial Correlation Test

The last diagnostic test is the test for serial correlation. Serial correlation refers to the relationship between a certain variable and itself over various periods of time. It is often found in repeating patterns when the level of a variable affects its future level. Observations are considered independent when the serial correlation of observation is zero. Observations that are serially correlated show that the observations do not develop from a random process, but are related to their prior values (Hair et al., 2011).

Observations that are positively serial correlated exhibit mean aversion. This indicates that the observations are prone to trends and the measurement of returns over a longer time will produce higher standard deviation compared to independent subperiod returns. Observations that are negatively serial correlated demonstrates mean reversion which means that the observations tend to lean towards the average value over time and returns measured over a longer time will result in lower standard deviation than independent subperiod returns (Hair et al., 2011).

Serial correlation causes coefficient regression to be consistent but inefficient, with biased standard error. Baltagi et al. (2005) introduce a number of serial correlation tests, such as, i) first order autoregressive process, AR(1), ii) second order autoregressive process, AR(2), iii) fourth order autoregressive process, AR(4) and lastly, iv) first-order moving average, MA(1). Nevertheless, this study will involve only two (2) serial correlation processes, i) first order autoregressive process, AR(1) and ii) second order autoregressive process, AR(2).

In summary, the diagnostic tests are conducted to assure that the model built is a good model to test the independent variables on the dependent variable. It is also to ensure that the regression result is efficient, consistent and unbiased.

(iv) Pool Ordinary Least Square (POLS) Regression

The first static model estimation procedure is Pool Ordinary Least Square (POLS). POLS is the pooled analysis for panel data. Panel data is the combination of times series data (T) and cross-sectional data (N). It is characterized by repeated observation (commonly years) on fixed units (cross-sectional). This means that TxN is arranged as pooled data set. So, the linear regression of POLS procedure is as the following;

$$JC_{st} = \beta_1 + \sum \beta_k x_{kst} + e_{st} \quad (3.11)$$

Where k is specific explanatory variable. Thus, JC_{st} refers to the dependent variables and x_{kst} refers to the independent variable for unit sub-industry, s, and t is refer to current time; and e_{st} is a random error. The intercept of the regression is referred by β_1 and β_k refers to the parameter of the regression (Podestà, 2002).

The causal heterogeneity across times series and cross-sectional cannot be captured if the estimation is constant-coefficient model. So, OLS estimator potentially to have insignificant and inefficient parameters and imprecise value of standard error, but with consistent value of coefficient.

(v) Random Effect (RE) Regression

The second static model estimation procedure is Random Effect (RE). RE refers to the analysis of dependent variable affected by a large number of factors.

There are some factors that are directly measured in the model and the rest summarised by random distribution. The RE model is satisfied by two conditions; i) to treat each of the unobserved explanatory variable as being drawn randomly from a given distribution. Unobserved effect that is treated as random variables can be handled by inserting the unobserved effect into the disturbance term, and ii) unobserved explanatory variable is distributed independently of the entire observed explanatory variable, *x*.

The specification regression of RE is subject to a special form of autocorrelation and it needs an estimation technique to consider, such as; i) checking the other regression model related to the disturbance term. Assume that the disturbance term satisfies the usual regression model condition. So, disturbance term is expected to be zero, and ii) disturbance term satisfies the condition that non-zero component is being absorbed by the intercept. So, the condition of disturbance term should have constant variance.

(vi) Fixed Effect (FE) Regression

Lastly, the estimation procedure for static model is Fixed Effect (FE). FE is a spurt model that concentrates on a set of cross-sectional, i.e. industry and the inference is restricted to the industry behaviour. The purpose of FE is to eliminate the unobserved effect.

Referring to this study, every industry has its own characteristics. These characteristics may or may not affect the predictor variables. FE regression is assumed to have all time constant characteristics to all industry. Besides that, it is also assumed to have unrelated time-constant with industry characteristics. In FE regression model, the difference in time-constant between industry is controlled by omitting time-constant characteristics. This leads to unbiased estimated coefficient in FE regression model.

The simple FE model can be transformed into the binary FE model by including binary variables in the regression equation. Once the simple model is transformed into the binary model, it will suffer the loss of a significant number of degree of freedom. The transformed process causes every single sample a loss of one degree of freedom. There would be nT-k degree of freedom from balanced panel data with nT observation. In the transformation model, the number of degree of freedom is reduced by n. In the case where T is small, the loss in the degree of freedom will have a big impact.

However, there are also several limitations in the FE model. One of the major limitations is that the time constant covariate effect cannot be estimated because the effect is cancelled out by the transformation within. This weakness reflects the inability of the panel data to identify the causal effect of a time constant covariate. This happens because the FE model requires some variation in x. Without this variation, the effect could not be estimated and the standard error will be large.

3.6.3 Generalized Method of Moment (GMM) Regression

Equation (3.10) developed into dynamic model, based on the persistent characteristic of job creation (Steven John Davis & Haltiwanger, 1999). This study expects job creation in the previous year (JC_{st-1}) to determine job creation in the current year (JC_{st}). So, the dynamic model is written as;

$$JC_{st} = \alpha_{st} + \beta_1 JC_{st-1} + \beta_2\, y_{st} + \beta_3 w_{st} + \beta_4 a_{st} + \beta_5 r\&d_{st} + \beta_6 r\&d_{st-1} + \varepsilon_{st} \quad (3.12)$$

Generalized Method of Moments (GMM) is a popular technique among researchers using economic data. Hansen and Sargent (2007) describes this method as a set of estimators produced from time assessment of population (also known as orthogonal condition). First introduced by Hansen (1982) and proposed by Arellano and Bond (1991) and Blundell and Bond (1998). The GMM estimators has a structural fault component that is ignored, as well as general variant-covariant matrices, which are estimates across time dimension. Baum, Schaffer, and Stillman (2003) claims the GMM estimator is more efficient. In addition, Arellano and Bond (1991) have the opinion that the use of exclusive exogenous variables is explicit and fair, but imperfect, due to the complexity of finding the actual external variable.

The GMM method does not require complete knowledge of data distribution. The GMM method reduces both assumption of series and heteroscedasticity, therefore it is appropriate in obtaining unbiased and consistent estimator parameters, even though in weak distribution assumptions.

Estimation process using Ordinary Least Square (OLS) will be biased. Descending bias occurs when the model uses Fixed Effect (FE) method. Therefore, to overcome the bias problem, Arellano and Bond (1991) suggest the GMM difference method.

(i) Generalized Method of Moment-Difference (GMM-Difference)

The GMM difference method is an alternative method proposed by Arellano and Bond (1991) to overcome certain cross-sectional effect and endogenous problem. This method is known as GMM difference because of the predicted estimator after the first differentiate eliminates the constant effects. In this approach, the lagged differences are predetermined. Dependent variables and endogenous variables are reinforced by the values in the preceding level. In other words, the unobtrusive regressor level is impaired or is known as a transformation instrument variable. This situation only occurs when the assumption of $E(\Delta y_{i,t}\varepsilon_i) = 0$ and $E(\Delta x_{i,t}\varepsilon_i) = 0$, which has the probability of achieving additional moment requirement.

Assuming that there is a positive correlation between the explanatory variables and special effect in the cross-sectional sample which is unobserved, Arellano and Bond (1991) proposed the transformation forward of orthogonal deviation or first differentiation to eliminate certain cross-sectional effects that usually exist in the panel data. This technique is similar to the FE method for cross-sectional specific removal. However, the differentiation also creates a new problem of endogeneity that exist in the correlation of lagged dependent variable, with the term new error. Usually, endogenous bias will affect all other coefficient estimates.

According to Abdul Karim, Azman-Saini, and Abdul Karim (2011), the transformation carried out also causes the potential explanatory variable to be endogenous. The problem arises because there is a correlation between the transformation variables and error transformation. Hence, three assumptions can be formed about the explanatory variables, such as;

1) The explanatory variable x_{it} can be determined by a variable that correlates with the previous time error or $E[x_{it}\varepsilon_{is}] \neq 0$ for $s < t$, but $E[x_{it}\varepsilon_{is}] = 0$ for all $s \geq t$.
2) The explanatory variable, x_{it} also can be an endogenous variable that potentially correlates to the current and previous error, or $E[x_{it}\varepsilon_{is}] \neq 0$ for $s \leq t$, but $E[x_{it}\varepsilon_{is}] = 0$ for all $s > t$.

3) The x_{it} is assumed to be firmly exogenous if $E[x_{it}\varepsilon_{is}] = 0$ for all t and s, where no correlation wither between current error, previous error or future error.

The issue of endogeneity can be overcome through instrument variable (IV). IV for independent variable, x is one of the solutions to the problem of biasedly-removed variable. The IV technique is a good tool when it fulfils two (2) conditions; i) the IV is not related to error terms and ii) the IV has a strong correlation with endogenous explanatory variables.

There are several types of IV estimators such as Wald estimators for binary instruments, estimators ofInstrument Variables (IV) and least-square estimators of the least squared (2SLS). However, in the GMM method, Arellano and Bond (1991) suggest lagged levels of regressors as instrument variables. The advantages of the IV estimator in GMM method is that it considers and explores all the information contained in the sample. Therefore, this method is more efficient in estimating dynamic panel model. The moment condition is required in ensuring that the IV is valid and exists in two conditions. If the instrument for regression is different, then the corresponding variable is in the same level.

On the other hand, the corresponding variables in regression are in the lagged differences. Generally, if variable x_{st} is endogenous, x_{st-2} and initial level of x_s is prepared as a valid instrument for Δx_{st} in the first level differential equation and Δx_{st-1}. The initial Δx_s is prepared as an instrument at the equation level for x_{st} if x_{st} is endogenous. Assuming that the explanatory variable, x has a weak connection with the exoganeous and irrelevant error term (Arellano & Bond, 1991).

Although the estimator explained above are successful in addressing the specific effects of the cross-sectional sample and endogeneity problem, it also has a huge weakness. The weakness is recognized when lagged dependent and explanatory variable persist across time or close to random walk. Hence, the lagged level of the variable is a weak instrument to the regression in differential equation (Alonso-Borrego & Arellano, 1999; Blundell & Bond, 1998). The weak instrument causes bias in the estimation of parameters in small samples and large variations of asymptotic.

(ii) Generalized Method of Moment-System (GMM-System)

The GMM system method is a method that combines regression in differentiation and regression at the level. Blundell and Bond (1998) indicate that the lagged level of explanatory variable is a weak instrument of the equation regression in differentiation when this variable persists from time to time or approaching random walk. In order to reduce the bias and non-peculiar potentials of differentiating estimator, Blundell and Bond (1998) suggest this method by adding new assumptions, namely, the first differentiation of the instrument variables is not related to Fixed Effect (FE). As a result, more instruments can be introduced and the efficiency of estimators can be improved.

The weak instrument affects the asymptotic performance and small sample differential estimators. The asymptote coefficient variance will increase. In small sample, an instrument can produce biased coefficient, Blundell and Bond (1998) agree with the use of additional time methods for small and short time series sample. Based on the assumption that there is no correlation between differentiated variables and cross-sectional specific effects with bias on independent variables.

In the Monte Carlo case, Blundell and Bond (1998) show that this estimator is better than GMM difference method, specifically in two (2) cases; i) in short term and ii) if the variable is persistent across time.

If the evolution of the variable is strongly persistent, the correlation between variables in differentiation and previous value will be lost. Thus, the previous value is a weak instrument when using GMM difference estimator. Blundella, Bondb, and Windmeijer (200I) demonstrate in simulations that include weak exogenous covariates where GMM difference estimator for lagged dependent variables are strong and downward bias in the same direction as in the estimator. However, the GMM system can generate momentum prolifically. Too many instruments in this method will cause some endogenous variables to be precise.

(iii) Generalized Method of Moment-One Step and Two Step

Arellano and Bond (1991) set two types of variance in GMM estimator, namely one step and two step variances. One step variance uses a weighting matrix independent of the estimated parameters. One step estimator minimizes;

$$W_{N1} = \left(\frac{1}{N}\sum_{i=1}^{N} z_i' A_N z_i\right)^{-1} \tag{3.13}$$

Regarding such case where the error is homoscedastic and not related over time, the measurement of GMM one step estimator is efficient. Additionally, the study of Monte Carlo evidently suggests that in most cases, one step GMM estimator produce more efficient estimator than two step estimator (Rousseau & Wachtel, 2002). Whereas, the two step GMM estimator use the optimum weighting matrix where time conditions are weighted by their covariance estimators. For that reason, two step estimator asymptotes are more efficient than one step estimator.

However, the two- step estimator has some weaknesses, specifically in small samples. The problem is a result from the various instrument, such as standard error that tends to be too small. Simulation analysis by Windmeijer (2005) indicates that many instruments in the two step GMM estimators cause bias not only for standard error, but also parameter estimator. In addition, Bond (2002) states that many instruments produce weak result for all identities.

(iv) Hansen and AR Test Specification Test

There are three (3) specification tests proposed by Arellano and Bond (1991) Arellano and Bover (1995) and Blundell and Bond (1998) to test the degree of fitness of GMM estimator in producing unbiased, consistent and efficient results. The use of appropriate instrument will determine the goodness of the model.

One of specification test is AR test that determines the error term correlation, as well as the assumption of the absence of serial correlation $\varepsilon_{i,t}$ which is important for consistency in estimators. If there is no correlation associated, there is a negative series correlation in AR(1) test, and there is no evidence of serial correlation in the second stage test (AR(2)).

Apart from that, given the fact that there are identified models with more instruments than estimated parameters, the validity of the instruments can be tested using the Sargan Test and the Hansen Test. The tests take into the account the sets of instruments used and the requirements to qualify orthogonally to validate the null hypothesis which is true along with the instrument. Sargan and Hansen Test is under the null distrbution with degree of freedom (p-k; where p is total number of instrument and k is total number of variables).

Failure to reject the null hypothesis proves that the instrument is valid because there is an association between the error and the first differential equation. The differentiation in Hansen Test is used to validify the overtime condition on the GMM system method. This test measures the difference between Hansen statistic generated from the GMM system and GMM difference method. Accepting the null hypothesis means the overdue terms are valid.

3.7 Chapter Summary

This chapter has presented the methodology used to accomplish the research objectives as need as the process of developing research framework. A list of of hypotheses were stated based on the research framework. Data collection method and the variables measurement, as well as the analytical methods used to answer the research questions were also discussed. The descriptive analysis method was used to answer research question number one and two, while the econometric regression, namely GMM technique was used to answer research question number three of this study.

CHAPTER FOUR

DISCUSSION OF RESULTS

4.1 Introduction

This chapter discusses the overall findings of this study, including rate, pattern and determinants of job creation in the Malaysian manufacturing sector. Finding on the rate of job creation in the sub-sector of Malaysian manufacturing sector fulfils the first research objective. The discussion includes the job creation rate by sub-sector detailing the mean, maximum and minimum rate. On the other hand, pattern of job creation in the sub-sector of Malaysian manufacturing sector which answering objective number two, provide result in term of direction, magnitude and stability. Lastly, this chapter reported the factors determining job creation in Malaysian manufacturing sector, including descriptive statistics correlation analysis and pooled OLS regression (POLS). Discussion is also on random effects (RE), fixed effects (FE), panel diagnostic test and Generalized Method of Moment (GMM) results.

4.2 Job Creation Rate in Sub-Sectors of Malaysian Manufacturing Sector

The result on job creation rate is based on 54 industries which are divided into 11 sub-sectors as shown in Table 4.1. The 11 sub-sectors are, 1) Food, Beverages and Tobacco, 2) Textile, Clothing, Leather apparel and Footwear, 3) Wood, Furniture, Paper and Printing, 4) Optical, Media and Photography, 5) Petroleum and Chemical Product, 6) Non-metallic and Fabricated Metal, 7) Machinery and Equipment, 8) Fibre Products, 9) Electric and Electronic, 10) Automotive and Transportation, 11) Other Manufacturing.

Table 4.1 shows the average job creation rate based on proportion result of job creation rate by sub-sectors during the study period of 2005-2015. The result in Table 4.1 shows that the average job creation rate across 11 sub-sectors varies between 0.08 to 0.16. This indicate that there is wide variation from the centre tendency of job creation rate among the 11 sub-sectors in Malaysian manufacturing sector. This implies that, on average, there were some sectors among the 11 sub-sectors in Malaysian manufacturing sector which recorded dynamic or high job creation rate. The finding also showed that there is a sub-sector that dominate job creation rate during 2005-2015 study period. This sub-sector which recorded the highest average job creation rate of 0.16 or 16% is Optical, Media and Photography sub-sector.

Table 4.1:
Average job creation rate of 11 sub-sectors of the Malaysian manufacturing sector.

No	Sub-sector	Average rate
1	Food, Beverages and Tobacco	0.12
2	Textile, Clothing, Leather Apparel and Footwear	0.09
3	Wood, Furniture, Paper and Printing	0.08
4	Optical, Media and Photography	**0.16**
5	Petroleum and Chemical Product	0.12
6	Non-metallic and Fabricated Metal	0.08
7	Machinery and Equipment	0.11
8	Fibre Product	0.08
9	Electric and Electronic	0.08
10	Automotive and Transportation	0.12
11	Other Manufacturing	0.10

Source: Author's calculation based on formula by Davis (1992)

Meanwhile, several sub-sectors which recorded lower average job creation rate of 0.08 (8%), were Wood, Furniture, Paper and Printing, Non-metallic and Fabricated Metal, Fibre Product and Electric and Electronic (See Table 4.1). Based on the findings, the Optical, Media and Photography was the sub-sector which recorded the highest demand for labour as indicated by the job creation rate in the Malaysian manufacturing sector over the period of2005 to 2015. On the other hand, the lowest job creation rate was recorded by Wood, Furniture, Paper and Printing, Non-metallic and Fabricated Metal, Fibre Product and Electric and Electronic sub-sectors.

Table 4.2 shows the job creation rate of the 11 sub-sectors for each year from 2005 to 2015. This study found that among the 11 sub-sectors, the sub-sector of Petroleum and Chemical Product recorded the highest job creation rate of 0.86 in 2011. The result shows that this sub-sector performed exceptionally high demand for labour through job creation in 2011. The possible reason for the highest job creation recorded in 2011 was contributed by a few industries in the sub-sector, namely Refined Petroleum and Other Chemical industries. Another contribution factor is that the Malaysian govermnent has approved a massive investment in term of technology in this sub-sector to increase production volumes. This has encouraged industries in this sub-sector to expand their production and increased the labour force participation according to MIDA (2012). Consequently, the purpose of increasing the job creation is to ensure the production process would not be disrupted (Brown, Earle, & Telegdy, 2006).

Sub-sector of Automotive and Transportation recorded the second highest job creation rate in 2010 of 0.51 (see Table 4.2). This sub-sector was the next sub-sector recorded high job creation rate in the Malaysian manufacturing sector notably in 2010. The highest job creation rate contributed in the sub-sector was by the industry of Transport Equipment and Airplanes and Spacecraft. Similar to the Refined Petroleum sub-sector, the Malaysian government has invested a substantial amount of R&D expenditure in Transport Equipment and Airplanes and Spacecraft sub-sector. The purpose of this investment was to upgrade the sub-sector as one of the sub-sectors that produces a high-tech and competitive output. It was in line with the government's goal to put the sub-sector as one of the major contributors of the Malaysian manufacturing sector by 2020 (MIDA, 2012). As a result, the investment in R&D required more labour participation in this sub-sector, hence, the job creation rate in this sub-sector recorded the highest in 2010 compared to other sub-sectors in the same year.

As shown in Table 4.2, job creation rate in the sub-sector of Electric and Electronic recorded the rate between 0.00 to 0.35 from 2005 to 2015. This result shows over the period of study, although it did not recorded a large magnitude of job creation rate, but it was the demand for labour was consistent and moderate job creation existed in every year. The Electric and Electronic sub-sector has undergone structural change in order to expand production volumes. The structural change was expected to create large job creation, which required the sub-sector to demand for high skill labour force through performing high skill job creation (MIDA, 2014). However, the cost in performing high skill job creation was expensive, so job creation rate turned out to be less than expected. The cost in performing high skill job creation has increased the production cost, hence lower down the profitability of the firms, which directly discouraged the sub-sector to demand for higher labour (Flinn, 2006).

Although, not included as a sub-sector that support the growth of Malaysian manufacturing sector, the Food, Beverages and Tobacco shows a consistent job creation rate every year between 0.02 and 0.36 over the period of study. The highest job creation rate recorded was 0.36 in 2009 and the lowest was in 2006 (0.02). The increasing production volume of Food and Beverages industries, either domestically or globally has led to increase in demand for labour by employers in this sub-sector. This was to serve market demand. In contrast, Tobacco industry, recorded zero job creation rate. This was due to the government initiative to discourage smoking and this has impacted the production volume and employment in the sub-sector (MITI, 2014).

Other sub-sectors recorded a consistent, albeit a small size of job creation rate in every year from 2005-2015 as recorded in Table 4.2. These sub-sectors such as Wood, Furniture, Paper and Printing sub-sector recorded job creation rate varies between 0.01 to 0.33. The job creation rate between 0.01 to 0.38 was noted in sub-sector Machinery and Equipment. Also, in sub-sector of Fibre product, it is found that the job creation rate varied between 0.01 to 0.32.

In conclusion, the variation of average job creation in the 11 sub-sectors of the Malaysian manufacturing sector over the past ten-years is similar to the job creation rate recorded in US manufacturing sector over the period of 1972 to 1986 (Steven J Davis & Haltiwanger, 1992). Several OECD countries job creation rate found by Contini and Revelli (1997) was between 0.084 to 0.146. Also, almost close to the annual job creation rate in a few states from 1995-2005, found by Dries and Ciaian (2012) such as France (0.07), Portugal (0.12), Spain (0.17), UK (0.06) and Belgium (0.05). Based on the study's finding and statistics of other countries, it can be concluded that the job creation rate in individual sub-sector of the Malaysian manufacturing sector was almost equal to the annual job creation rate in developed countries.

The range between the 11 sub-sectors in the Malaysian manufacturing sector shows small to medium fluctuation in demand for labour every year between the sub-sectors. The result indicates that the sub-sector (or the overall manufacturing sector) are not affecting by external shocks such as the sector's structural change and economic cycle that may led to a large change in the output production, job structure, demand for labour and job creation (Dries & Ciaian, 2012).

This small, medium fluctuation in job creation rate is in line with Mortensen and Pissarides (1994). The researchers found that the cost for employers to do newly job creation and hire new employees is more expensive than the cost of upgrading the existing jobs with upgrading existing workers' skill. Therefore, in the event of structural change in production process or economy cycle, employers choose to upgrade jobs rather than creating new jobs. This reduces the demand for labour, led to small to medium size of job creation rate in every year as witnessed in the sub-sectors of the Malaysian manufacturing sector (see Table 4.2).

The Malaysian manufacturing sector is expected to be capital intensive and knowledge-based production with asset such as machinery and equipment dominating the production process. Mortensen and Pissarides (1999) found the existing inverse correlation between capital-intensity and demand for labour. The finding of the medium range of job creation rate in Malaysian manufacturing sector suggests that this is due to the high capital-intensity in the sector. The capital-intensive (machinery and equipment) is basically a substitute to labour which in turn discourages employers to create jobs.

The above discussions provide explanation on the why the rate of job creation in the sub-sectors of the Malaysian manufacturing sector is small to medium over the study period.

Table 4.2:

Job creation rate, 11 sub-sectors in Malaysian manufacturing sector (2005-2015)

Sub-sector	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**Maximum**	**Minimum**
Automotive and Transportation	0.10	0.05	0.11	0.04	0.07	**0.51**	0.04	0.20	0.09	0.09	0.04	**0.51**	**0.04**
Electric and Electronics	0.05	0.04	0.02	0.05	0.13	0.02	0.02	**0.35**	0.09	0.09	0.00	**0.35**	0.00
Fibre Product	0.16	0.02	0.09	0.01	0.01	0.33	0.12	0.05	0.05	0.05	0.01	0.33	**0.01**
Food, Beverages & Tobacco	0.13	0.02	0.10	0.16	0.36	0.05	0.23	0.10	0.04	0.04	0.04	0.36	**0.02**
Machinery and Equipment	0.16	0.13	0.16	0.01	0.05	0.02	0.39	0.14	0.08	0.07	0.01	0.39	**0.01**
Non-metallic and Fabricated Metal	0.09	0.05	0.16	0.04	0.00	0.10	0.16	0.00	0.10	0.10	0.01	0.16	0.00
Optical, Media and Photography	0.15	0.13	0.02	0.35	0.44	0.01	0.00	0.32	0.16	0.10	0.05	0.44	0.00
Other Manufacturing	0.04	0.11	0.13	0.03	0.33	0.04	0.33	0.00	0.00	0.00	0.13	0.33	0.00
Petroleum and Chemical Product	0.10	0.04	0.01	0.06	0.07	0.02	**0.86**	0.00	0.04	0.05	0.08	**0.86**	0.00
Textile, Clothing, Leather apparel, and Footwear	0.02	0.03	0.06	0.00	0.00	0.44	0.12	0.14	0.05	0.05	0.06	0.44	0.00
Wood, Furniture, Paper and Printing	0.13	0.02	0.13	0.01	0.34	0.07	0.09	0.00	0.06	0.06	0.00	0.34	0.00

In cases where the job creation rate high were due to investment by government in the sub-sectors, in normal circumstances, the cost factor of creating new jobs and the capital intensive nature in the sector were the factors contributing to small to medium creating jobs in the Malaysian manufacturing sector.

4.3 Pattern of Job Creation in Sub-Sector of Malaysian Manufacturing Sector

The result on sub-sector displays a uniform, stable, lower magnitude, narrow variation in movement and procyclical behaviour of job creation pattern to each other at the early period of study (2005-2007). However, it started to show dynamic, mixed cyclical behaviour, medium to large magnitude and wide variation in movement in the middle of study period (2007-2012). This pattern was noted specifically in five (5) sub-sectors; namely Food, Beverages and Tobacco, Optical, Media and Photography, Automotive and Transportation, Textile, Clothing, Leather Apparel and Footwear and Petroleum and Chemical product. Towards the end of the study period (2012-2015), the job creation pattern shown by all sub-sectors is stable, low magnitude with downward movement, consistent and with narrow variation in movement (See Figure 4.1).

Figure 4.1 also show that the highest magnitude of job creation pattern was in 2009 experienced by sub-sectors of Optical and Photography, Food, Beverages and Tobacco, Other Manufacturing and Wood, Furniture, Paper and Printing. In 2010, sub-sector Automotive and Transportation, Textile, Clothing, Leather Apparel and Footwear and Fibre Product took the lead. These sub-sectors consistently demand for higher labour as indicated by job creation pattern despite Malaysia facing economic slowdown due to the spillover effect of the Global Financial Crisis in 2008.

Further discussion is to figure out whether job creation pattern in sub-sector is influenced by the sub-sector's characteristics or its own structure. Petroleum and Chemical sub-sector shown a higher magnitude of job creation pattern in 2011, compared to other sub-sectors. In contrast in the preceding years, the magnitude of job creation in this sub-sector was low but consistent. The earlier pattern reflects a high degree of concentration given to the Refined Petroleum industry in line with high labour demand through new jobs created. This is supported by the highest demand in production of Refined Petroleum, compared to slower demand in other Chemical industry (including sub-industry of chemical which produced rubber-based product). Slower demand in rubber-based products is due to sluggish in global and local demand for Rubber production, particularly from China (BNM, 2016).

Electric and Electronic sub-sector on the other hand, illustrates stable and consistent job creation pattern, with medium magnitude over the past 11 years. This sub-sector is categorized as the most stable job creation pattern compared to other sub-sectors throughout the study period. The industries in this sub-sector have high concentration which support job creation steady growth from 2005-2015. The stable demand for labour in this sub-sector is driven by the steady production growth in electronic component and electric and electronics domestic applicants (BNM, 2016).

Notably, the job creation pattern shown by two sub-sectors; Textile, Clothing, Leather Apparel and Footwear and Automotive and Transportation in 2010, displayed a procyclical movement to each other. Besides, both sub-sector also showed the highest magnitude in 2010 than the previous years over the past 11 years. However, in 2011, both sub-sectors showed a downward movement in which Automotive and Transportation sub-sector moved downward with lowest magnitude than Textile, Clothing, Leather Apparel and Footwear sub-sector. Practically, production of these two sub-sectors is unrelated to one another that requires employers to demand for labour with different skills. But the procyclical pattern of job creation in Automotive and Transportation sub-sector implies that, also as important as the Textile, Clothing, Leather Apparel and Footwear sub-sector in term of contribution to labour participation in the manufacturing sector as indicated by job creation.

Other sub-sectors analysed that showed significant job creation pattern was Food, Beverages and Tobacco. This sub-sector showed a large magnitude of job creation pattern in 2009, coupled with the sub-sector of Optical and Photography. Apparently, Malaysia's strength as a food producer is gaining momentum as production of Food and Oils as well as Beverages increased due to festivals and holidays, making this sub-sector consistently had high job creation over the study period. Besides demand for food, this sub-sector incurred many jobs because it manufactures basic necessities in daily life. However, production of Tobacco industry dropped as shown by the downward movement in the job creation of this industry. This is due to declining production of local leaf and the contraband market for cigarettes and higher tax on tobacco. Government initiatives on banning smoking in government premises, schools and shopping complexes. This contributed to the failure of this sub-sector to maintain labour engagement through job creation due to a decrease in output demand (Narayanan & Lai, 2014).

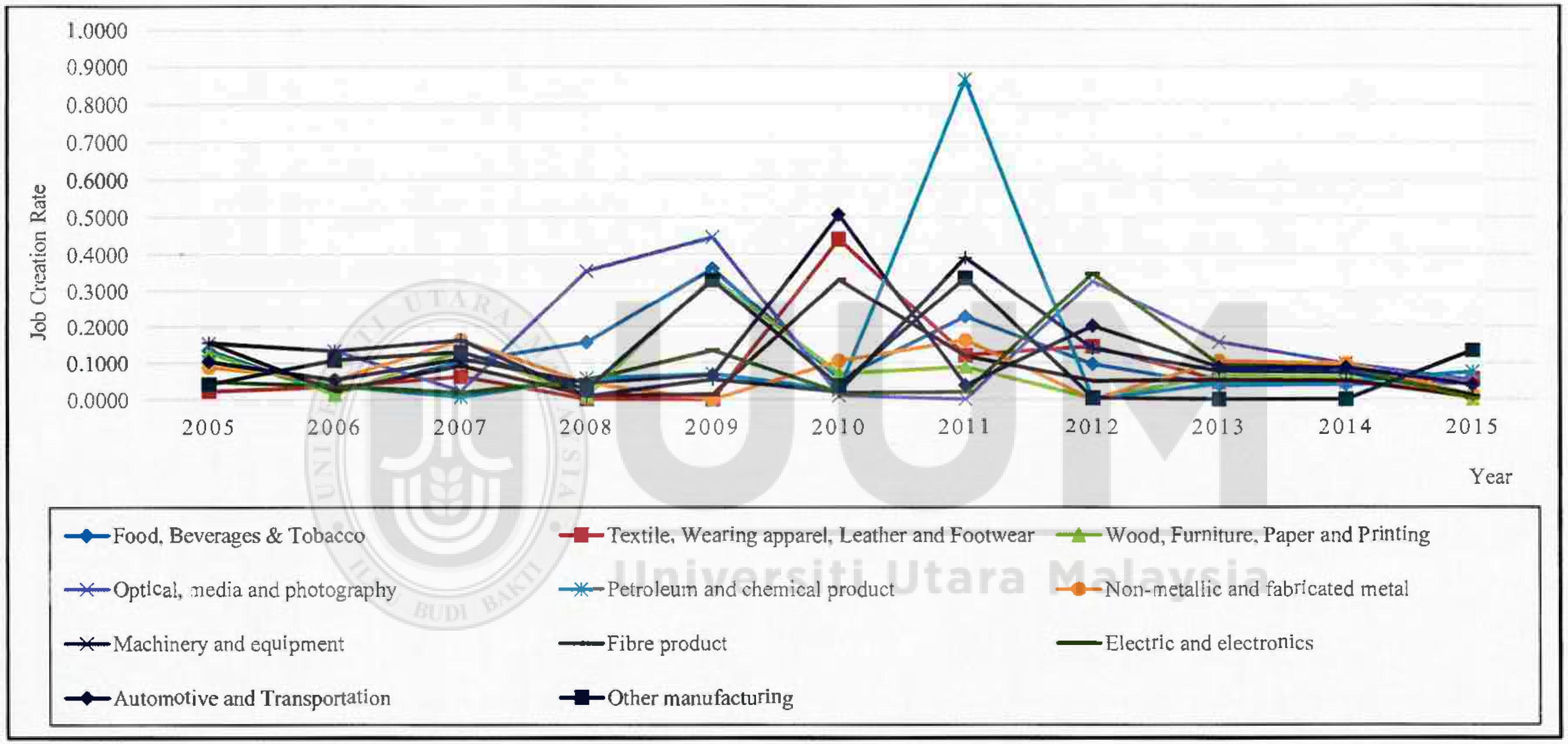

Figure 4.1:

Pattern of job creation, 11 sub-sectors in Malaysian manufacturing sector, over 2005-2015.

For Optical and Photography sub-sector, Figure 4.1 demonstrated a stable job creation pattern, except in 2008-2009 period. In these two years, this sub-sector recorded highest job creation compared to other sub-sectors due to high demand for labour for this sub-sector. However, job creation pattern declined during 2010-2011, but increased in 2012. The highest growth in job creation in 2008-2009 in this sector was underpinned by high demand of Media and Telecommunication receivers (EPU, 2010).

In summary, the finding from tbe analysis on job creation pattern exhibited medium variation in job creation pattern between the sub-sectors. All sub-sectors in the Malaysian manufacturing sector showed that the job creation pattern in the previous year effected employers' decision in job creation in the following year. As evidenced in Figure 4.1, there was continuous job creation pattern from year to year during the study period.

However, one distinct feature revealed was that the job creation pattern showed a fluctuating nature, where job creation increased in one year but decreased in the subsequent year. This pattern appears to suggest that job seekers consumed at least one year to filled a job search and matching process.

On the employers' side, the demand for sub-sector production either domestically or internationally affects their decision to do job creation. Therefore, demand for labour through job creation in Malaysian manufacturing sector is also dependent on the sectors' production level.

4.3.1 Job Creation Pattern According to OECD Classification of Technology

Job creation pattern in technology-based sub-sectors over 2005-2015 period is shown by Figure 4.2. High technology level sub-sector (see blue colour line) exhibited a dynamic movement with steady growth from 2007 to 2010, a sharp decrease in 2011 escalated in 2012, then dramatically decreased in 2013. The sharp decrease in 2011 indicated there were zero job creation albeit zero demand for labour in this sub-sector during 2011. This is because, the Malaysian government has increased R&D expenditure in this sub-sector in term of sophisticated machinery and equipment. The purpose was to upgrade the output of this sub-sector and to ensure smooth production process (MIDA, 2012). These sophisticated machinery and equipment requires employers to demand high skill labour to carry out the operation process, through performing high skill jobs. However, high skilled workers are expensive than low skill ones. This would increase cost of production and less profitability to employers, which discouraged them to engage job creation (Klein et al., 2003).

In addition, the Malaysian government has re-evaluated its policy by focusing on some key industries in this sub-sector (such as Airplanes and Spacecraft and Media and Telecommunication Equipment). Greater fund was allocated to the R&D expenditure and awarding several initiatives to these industries to encourage employers to create high skill jobs. One of the initiatives was to set up the Aero structure Manufacturing Innovation Centre (AMIC). This centre would provides skill training to labour to carry out the production activity relating to aircraft (MIDA, 2012).

Reported in MIDA (2012), the Malaysian government also increased the incentives to the usage of High Speed Broad Band (HSBB) in 2011. This was in line with the goal to transform Malaysia into a high-income country, to create educated society and knowledge-based production activities. This incentive has encouraged consumers to demand for media and telecommunication kit, simultaneously increasing the demand for its production. In response to this demand, employers need to increase labour force through creating new job.

Despite of expensive cost of performing high skill job creation, employers continue to perform high skill job creation with the expectation that the profitability gain from the increase in production will offset the cost (Cahue, Carcillo, Zylberberg, & McCuaig, 2014).

High-medium technology level sub-sector (see red colour line in Figure 4.2) showed stable and consistent pattern in movement over the period of study. This result implies that High-medium technology sub-sector consistently demand labour, thus constant job creation. The availability of job created ensure adequate supply of labour to ensure operation activity in this sub-sector is not disrupted. In contrast, significant difference is shown by the job creation pattern in Low-medium technology level sub-sector (see green colour line in Figure 4.2). Unlike the high-medium technology pattern, this low-medium technology displayed a sharp peek in 2011, then fell sharply in 2012, followed by moderate job creation growth from 2013 to 2015. The increase of job creation in this sub-sector during 2011 implied that here was a high demand for labour by creating many jobs during the year. This is because Malaysian government has been focusing on Petroleum and Chemical and Electric and Electronic sub-sectors as the key industries under the Economic Transformation Programme. A greater investment in term of R&D expenditure was allocated to promote production volume and upgrading output into high-end products. Additionally, this increased investment also caused several industries in this sub-sector to undergo structural change in their production. For example, Electric and Electronic sub-sector has shifted its operation to front-end process which requires semi-skill labour (MIDA, 2014).

As to the Low technology level sub-sector (see purple colour in Figure 4.2), the pattern of job creation was stable and consistent in movement over the period of study. There was a substantial magnitude of job creation every year from 2005-2015, except during 2009. In which job creation was the highest despite the economic downturn in 2009, the high job creation during the year implies that this sub-sector experienced an increase demand for labour and job creation. Demand for labour in this sub-sector is expected to continue throughout the year and not affected by the external shocks, due to the industry features in this sub-sector. Most of the industries in this sub-sector have common feature of producing consumer goods such as Food, Beverages and Tobacco, Wood and Furniture as well as Textile, Fabrics, Leather Apparel and Footwear. Therefore, regardless of any economic situation, the demand for production is expected to continue to meet the population demand. Hence, employers are expected to continue to create jobs and engage in the production process. In addition, the use of low technology level in this sub-sector allows firms to perform low skill jobs, thus more job creations to support labour intensive nature of the industries in this sub-sector.

As to the findings on the pattern of job creation, it would be summarised that the difference technology levels (R&D expenditure intensity) within the sub-sectors has resulted in different job creation pattern.

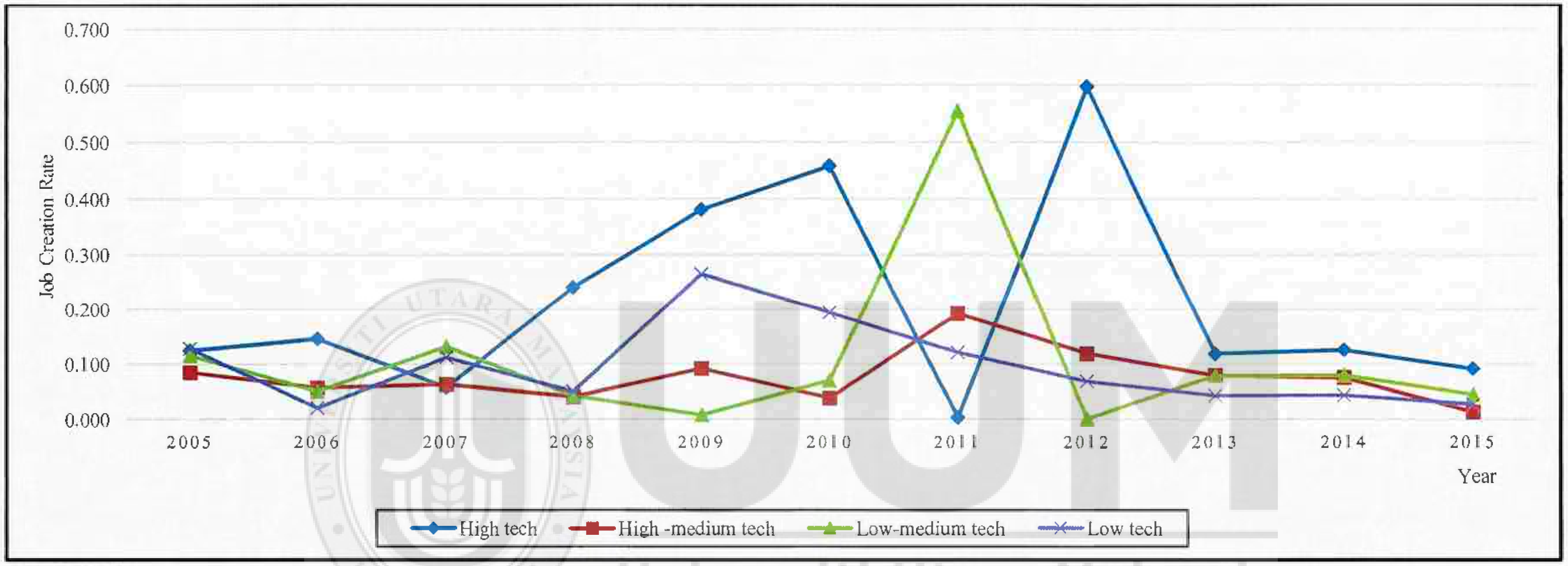

Figure 4.2:

Pattern of Job Creation in Four (4) Sub-Sectors of Malaysian Manufacturing Sector Based on OECD Technology Classification from 2005-2015

The higher the technology level, the more dynamic and significant is the magnitude of job creation pattern. However, the higher the level of technology used in the sub-sectors, the fluctuating in the job creation as high skill labours are very expensive and therefore, their jobs are taken over by the new technology and advanced equipment. On the other hand, low technology level sub-sectors are seen to have stable jobs created as low-skill jobs are labour intensive. The finding also highlights that as Malaysia undergoes higher technology and upgrade it R&D intensity, it faces shortage of high-skilled labours and high skilled jobs.

4.4 Empirical Result of Determinant of Job Creation on Malaysian Manufactnring Sector

4.4.1 Descriptive and Panel Correlation Analysis

This study uses job creation rate at previous year, real output, real wages, real assets, real research and development (R&D) expenditure and real research and development (R&D) expenditure at previous year as determinants factors of job creation in Malaysian manufacturing sector.

Table 4.3 reports results of the descriptive analysis for the six (6) variables used, including dependent variable, over the period of 2005 to 2015. The mean value of job creation is 0.3115, minimum value is 0.000, maximum value is 10.007 and value of standard deviation is 0.7314 for job creation across the 54 industries in the Malaysian manufacturing sector. This mean value of 0.3115 is comparable to that of job creation in UK manufacturing sector of 1.6 by Konings et al. (1996) and job creation rate found by Dries and Ciaian (2012) in Portugal of 0.131, Spain of 0.172 and Germany of 0.08.

Table 4.3:

Descriptive statistics for job creation in Malaysian Manufacturing Sector

No	Variables (unit)	Mean	Standard deviation	Minimum	Maximum
1	Job creation rate	0.3115	0.7314	0.0000	10.0007
2	Real output ('000)	307 135	611 901	92	5157741
3	Real wages ('000)	16 336	22 935	11	204 972
4	Real asset ('000)	6173 815	1.39e+07	1877	1.36e+08
5	Real R&D ('000)	285 058	1582317	27	1.84e+07
6	Real lag R&D ('000)	162 828	1049813	21	1.55e+07

The mean value of real output for the period of study was RM307 135 000. In term of R&D expenditure after net of inflation, the mean value was RM 285 058 000. This variable showed a large standard deviation which indicate that the amount of investment in R&D expenditure injected by the government varied between the years. Based on the data, it was found that substantial amount was injected in R&D expenditure after 2010. Table 4.4 reports correlation matrix between the variables used in this study. It is found that high correlation namely real output with real wages and real assets, while real research and development (R&D) expenditure with the real research and development (R&D) expenditure at previous year. However, according to Hair et al. (2011) coefficient of 0.8 is still tolerable since it does not exceed 1.0. Hence, there is no serious multicollinearity issue an indicated by Variance Inflation Factor (VIF) of 4.07 (Refer Table 4.4).

Table 4.4:
Correlation matrix for job creation in Malaysian Manufacturing Sector

	JC	LRy	LRw	LRassets	LRR&D	LRlagR&D
JC	1.000					
LRy	0.0839	1.000				
LRw	0.0474	0.8040*	1.000			
LRassets	0.0625	0.8051*	0.6732	1.000		
LRR&D	0.0701	0.4511	0.4408	0.4965	1.000	
LRlagR&D	0.0704	0.4315	0.4507	0.3442	0.8531*	1.000

Note: * means >0.8

4.4.2 Static Model Analysis for Determinant Factors of Job Creation in Malaysian Manufacturing Sector

The results of all regression models was recorded in Table 4.5. The result of pooled OLS was in Column 2, random effects in Column 3 and fixed effects in Column 4. The results from random effects model is a better model than pooled OLS and fixed effects, as evidenced by the results of Breuch-Pagan LM Test compared to the Hausman Test. The result of random effects model shows that all variables are not significant as determinants of job creation and the model has a low R^2 value ($R^2 = 0.0099$).

Table 4.5:
Static model analysis for determinants of job creation in Malaysian manufacturing sector, 2005-2015

Variables	Pooled model	Random effects	Fixed effects	Fixed effect with corrected standard errors
Constant	-0.0285	0.0579	1.1278	-0.0285
	(-0.11)	(0.20)	(2.14)	(-0.18)
LRy_{it}	0.1155	0.0982	0.0224	0.1155
	(1.48)	(1.17)	(0.20)	(1.55)
LRw_{it}	-0.0727	-0.0855	-0.1467	-0.0727
	(-0.99)	(-1.04)	(-1.19)	(-1.10)
$LRassets_{it}$	-0.0171	-0.0105	-0.0189	-0.0171
	(0.24)	(0.14)	(-0.21)	(-0.33)
$LRR\&D_{it}$	0.0180	0.0212	0.0596	0.0180
	(0.28)	(0.33)	(0.77)	(0.41)
$LRlagR\&D_{it}$	0.0225	0.0201	-0.1263	0.0224
	(0.35)	(0.29)	(-1.07)	(0.51)
Number observation		594		
R-square (R^2)	0.0104	0.0099	0.0035	0.0104
Breush-Pagan LM test		4.46**		
Restricted F-test		1.61 ***		
Hausman test			8.60	
Heteroscedasticity (χ^2-stat)		4.6e+05***		
Serial correlation (F-stat)		2.158		
Multicollinearity (VIF)		4.07		

Notes: ***indicate significant at 1%, ** indicate significant at 5% and* indicate significant at 10%. The t-statistic are in parentheses ( )

Further test using the panel diagnostic test shows the issues of heteroscedasticity serial correlation in this static model. Therefore, this study applied the fixed effect with corrected standard error test. The results show p-value improved as a result of improvement in the value of standard error. It is shown in Column 5 in Table 4.5.

After considering the results of the random effect (RE) model, GMM was chosen as a better technique to analyse the determinants of job creation. Table 4.6 shows that the result of the GMM-twostep estimator is selected and presented.

4.4.3 Dynamic Model Analysis of Determinants of Job Creation in Malaysian Mannfacturing Sector

Table 4.6 shows the regression results of GMM twostep estimator. The result of GMM-SYSTEM twostep is selected in this study. The coefficient of job creation rate in the previous year (JC_{it-1}) is 0.0616, real assets (LRa_{it}) is 0.2096 and real research and development (R&D) expenditure in the previous year ($LRlagR\&D_{it-1}$) is 0.0321. These determining factors are significant (at 0.001) and influenced job creation rate in a positive direction. These findings are similar to the finding in Greek manufacturing sector by Skuras et al. (2003), Uthopian manufacturing sector by Shiferaw and Bedi (2009), South Africa by Kongolo (2010), Spain manufacturing sector by Alonso-Borrego and Collado (2001), Italy manufacturing sector by Piva and Vivarelli (2005) and European countries by Bogliacino and Vivarelli (2012).

In contrast, real output, real wages and real research and development (R&D) expenditure are significant but influenced job creation of Malaysian manufacturing sector in a negative direction. The regression coefficient of the real output (LRy_{it}) is -0.0634, real wages (LRw_{it}) is -0.1927 and real research and development (R&D) expenditure ($LRR\&D_{it}$) is -0.0414. This result is equal to the finding found in several studies such as in Ireland by Lawless (2013), US manufacturing sector by Klein et al. (2003) and Meer and West (2015) and Malaysian manufacturing sector by Said et al. (2010).

Subsequently, the job creation rate at the previous year (JC_{it-1}) influenced 0.0686 of the current year job creation rate (JC_{it}) in the Malaysian manufacturing sector. The result also shows that an increase in the use of real assets (LRa_{it}) by 1% in the Malaysian manufacturing sector resulting in 20.96% increase in job creation rate. Similarly, a 1% increase in real research and development (R&D) expenditure in a previous year ($LRlag\text{R\&D}_{it-1}$) promotes 3.21% job creation rate in Malaysian manufacturing sector.

For real output, the result shows that 1% increasing in real output (LRy_{it}) led to decrease in 6.34% job creation rate in Malaysian manufacturing sector. This opposite relationship between real output and job creation suggests that the production activity in the Malaysian manufacturing sector increase but job creation decrease. This is due to the shift from labour intensive to capital intensive process.

Although a 1% increase in real wages, this study highlights that job creation rate decrease by 19.27% in the manufacturing sector. Lastly, an increase in real research and development (R&D) expenditure ($LRR\&D_{it}$) by 1% reduced 4.14% job creation rate in this sector. Overall, the GMM-system twostep estimator results shows that real assets is the most significant factor influencing job creation ($\beta = 0.2096$), while the real research and development (R&D) in the previous year has the least influenced on job creation in the current year.

Table 4.6:

Dynamic model analysis for determinants of job creation in Malaysian manufacturing sector, 2005-2015

Variables	GMM-Difference	GMM-System
	Two step	Twostep
Constant (α)	0.504***	0.0616
	(0.06)	(0.06)
	[8.46]	[1.09]
JC_{it-1}	0.0318***	0.0686***
	(0.001)	(0.001)
	[22.10]	[72.32]
LRy_{it}	-0.0421***	-0.0634***
	(0.009)	(0.007)
	[-4.53]	[-8.95]
LRw_{it}	-0.1789***	-0.1927***
	(0.007)	(0.005)
	[-26.51]	[-42.24]
LRa_{it}	0.1565***	0.2096***
	(0.015)	(0.013)
	[10.71]	[15.63]
$LRR\&D_{it}$	-0.0309***	-0.0414***
	(0.009)	(0.009)
	[-3.60]	[-4.48]
$LRlagR\&D_{it-1}$	-0.0506***	0.0321***
	(0.014)	(0.008)
	[-3.75]	[4.23]
Sargan test	0.2752	0.4476
AR(1)	0.0006	0.0006
AR(2)	0.8287	0.5891
N	54	54
T	11	11
n	594	594

Notes: ***indicate significant at 1%, ** indicate significant at 5% and* indicate significant at 10%. The t-value are in parentheses [ ] and standard error are in parantheses ( ).

The goodness of the GMM system twostep estimator result is also supported by the Sargan and Auto-regression test, recorded in Table 4.6. The Sargan test under the null hypothesis is over-identifying restriction of instrument validity in the model. According to Blundell and Bond (1998), if null hypothesis is rejected, the Sargan test shows there is no serious problem with the validity of the instrument variable and the model is good. But, referring to the Table 4.6, the value of Sargan test is 0.4476, which indicate that the null hypothesis is accepted. In another word, alternative hypotheses is rejected. Hence, the model used in this study is over-identified and the model faced the validity problem of instrument variable. Therefore, GMM system was used.

4.5 Chapter Summary

In summary, the test results provide significant evidence that real asset, lag real R&D expenditure ($R\&D_{t-1}$) and lag job creation (JC_{t-1}) influenced positively the job creation. This implies that if government wishes to create more jobs in manufacturing sector, it should put efforts to increase these two (2) factors, namely assets, and R&D expenditure. The result support the hypotheses of this study.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter concludes the study in light of the literature reviewed on job creation nexus in Chapter Three and the findings to the objectives stated in Chapter One. Correspondingly, the information reported in this thesis elaborates and extends prior research on job creation nexus as well as in manufacturing sector. To recapitulate, the finding as presented in Chapter Four, are summarised in the subsequent section. Several contributions that can be drawn from the study and policy implication are presented.

5.2 Recapitulation of the Findings

This section recapitulates the findings according to the objectives of the study.

5.2.1 To calculate job creation rate in sub-sectors of the Malaysian manufacturing sector from 2005-2015

Over the study period of 11 years from 2005 to 2015, the job creation rate of the Malaysian manufacturing sector ranges from 0.00 to 0.86. On average, the jobs were created by 0.3115 for year. This record of job creation rate is similar to the UK manufacturing sector, Portugal, Spain and German. This finding is a proof that there were actually jobs being created, as opposed to the claim that employment growth was 0% since 2013 to 2015 in Malaysian manufacturing sector. The 0% of employment growth was an underestimate of the labour market performance of Malaysian manufacturing sector at that time because different measurement was used to measure job creation.

5.2.2 To analyse the pattern of job creation in sub-sector of Malaysian manufacturing sector based on OECD classification of technology from 2005-2015

For objective number two (2), this study found that the job creation pattern for that 11 years of study in the manufacturing sector was fluctuating, but dynamic in nature. For the first time, this study reported the job creation pattern by four (4) sub-sectors using OECD classification of technology. From this method of analysis, these 4 sub-sectors exhibited different patterns in job creation. Notably, the High technology level sub-sector shows the most fluctuating pattern. This is because R&D expenditure intensity in the manufacturing process is significant between the years. This pattern influenced rate of job creation.

5.2.3 To investigate the determinants of job creation in Malaysian manufacturing sector from 2005-2015

The present finding is in agreement with Alonso-Borrego and Collado (2001), Piva and Vivarelli (2005), Bogliacino and Vivarelli (2012) and Bogliacino, Lucchese, and Pianta (2013) who found positive influence of R&D expenditure on job creation rate in Malaysian manufacturing sector. It is therefore likely that such influence exists between R&D expenditure and job creation suggest that, although industries in Malaysian manufacturing sector technology in the production process, the small to moderate magnitude of job creation is performed with purpose to maintain their operations, with the requirement of skilled labour force through skilled job creation.

5.3 Contribution and Policy Implication

In the current economic scenario, domestically and globally, job creation rate is found to be a better and reliable alternative, specifically in Malaysian manufacturing sector to measure performance oflabour market. The issue arises on to how to measure the job creation, in particular, to the manufacturing sector because there was no standard and reliable system to measure it. This study contributes significantly to the body of knowledge by providing a systematic method of measuring job creation using Steven John Davis and Haltiwanger (1990). As a result, this study highlights that job creation actually took place during 2005 to 2015, which is in contrast to the previous reported of 0% employment growth. In addition, the result of sub-sectors job creation rate are new information, which are relevant to the policy makers and manufacturing sector fraternity

An important policy of increase in technology would decrease job creation and increase unemployment rate. A decreasing in job creation is due to limited supply of skill labour. Therefore, policy makers should try to strike a balance between using technology and innovation and job creation capacity.

A reasonable approach to tackle this issue in the future could be that the Malaysian government and industries in manufacturing sector should be in need to enhance collaboration between industries and training institution to nurture the relevance technical skill of domestic labour force, so it would be in line with the job requirement. This current finding of job creation rate and job creation pattern add greater understanding of labour market performance. This study also contributes to the body of knowledge on the determinants of job creation in Malaysian manufacturing sector.

5.4 Recommendation for Future Study

For future research, it is recommended to use both secondary and primary data as well as include all sectors in Malaysia such as Agricultural, Finance and Service, in future study. The purpose is to extend the scope of study by making comparison between sectors with larger data set, that would capture different findings. It is also recommended to use other variables such as economic cycle, economic shock, foreign labour and trade openness in in future study.

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